PROPOSED TOTAL MAXIMUM DAILY LOAD (TMDL)

Myakka River Basin

(HUC 03100102)

Sarasota, Manatee, Charlotte, Desoto, and Hardee Counties, Florida

United States Environmental Protection Agency

Region 4 serving the southeast

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1. Introduction

1.1 Background

Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987, public law 100-4, and the United States Environmental protection Agency's (USEPA/EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require each State to identify those waters within its boundaries not meeting water quality standards applicable to the water's designated use(s). Total Maximum Daily Loads (TMDLs) for all pollutants violating or causing violation of applicable water quality standards are required and established for each identified water that are not meeting designated uses even after technology-based controls are in place. Such allowable pollutant loads or other quantifiable parameters are established for a waterbody based on the relationship between pollutant sources and in-stream water quality conditions. These loads are established with consideration given to seasonal variations and margins of safety. By following the TMDL process, states can establish water quality-based controls to reduce pollution from both point and nonpoint sources and to restore and maintain the quality of their water resources (USEPA, 1991).

Florida's 1998 Section 303(d) list identified eight waterbodies in the Myakka River watershed as not supporting its designated uses due to pathogens, turbidity, total suspended solids, nutrients, dissolved oxygen (DO) and biological oxygen demand (BOD) impairments. The listed segments include Owen Creek, Upper Myakka River, Upper Myakka Lake, Mud Lake Slough, Big Canal Slough, Deer Prairie Slough, Lower Myakka River and Warm Mineral Springs.

This TMDL is being developed pursuant to the 1998 Florida 303(d) list and is compliant with the Consent Decree and settlement agreement in the Florida TMDL lawsuit that requires TMDLs be developed for waters on the state's 303(d) list according to certain conditions as outlined in the agreement.

Portions of the Myakka River have been designated as an Outstanding Florida Water which allows no degradation in water quality.

The objective of this study is to develop TMDLs for the impaired 303(d) listed segments' pollutants (except mercury listing) of the Myakka River watershed. Sections 2 through 8 present specific TMDL Endpoint and Water Quality Assessment, Source Assessment, Modeling Procedures, Allocation and Conclusion for all listed parameters at each identified segment, respectively. The Charlotte Harbor watershed in southwest Florida has been identified by the Southwest Florida Water Management District Comprehensive Watershed Management Program (CWM), Florida Surface Water Improvement and Management (SWIM) Program, and U.S. EPA National Estuary Program (NEP) as a priority management area. EPA Region 4, in cooperation with the Florida Department of Environmental Protection, is under court order per consent decree to propose all necessary TMDLs in the Myakka Basin by December 31, 2001 exclusive of mercury listings.

1.2 Description of Myakka Watershed

The Florida DEP 1996 305(b) report provides a general description of the Myakka Basin ecology as follows (FDEP, 1996):

> "The Myakka Basin lies in a transitional area between temperate and subtropical habitats. The upper basin, sitting in a flat marshy area with a small, fringing cypress floodplain, is very sparsely populated and developed, and used mostly for pasture and some citrus groves.
>
> The headwaters of the Myakka arise from marshes in Hardee County in southwestern Florida. The blackwater river then enters two successive impoundments, Upper Myakka Lake and Lower Myakka Lake (the latter is only partially impounded). This part of the basin, also sparsely populated, is mostly included in the 45-square-mile Myakka River State Park. The river receives some groundwater from a 150-foot-deep sinkhole at the base of Lower Lake Myakka.
>
> Below the park, the river winds crookedly through undeveloped marsh and swamp prairies until it widens into the Myakka Estuary. This area receives water from two main tributaries,

> Deep Prairie Creek and Big Slough Canal. The North Port and Port Charlotte developments lie just east of the estuary. The river traverses about 54 miles, draining roughly 540 square miles before discharging to Charlotte Harbor.
>
> Because the basin is relatively undeveloped and contains so many varied habitats (such as marshes, swamps, prairies, flatwoods, hammocks, and estuary), many endangered species have been found, and it is a popular recreational area. Much of the river is a State Wild and Scenic River and Outstanding Florida Water."

The Myakka watershed contains several areas of ecological, cultural and economic significance to southwestern Florida including Myakka State Park, Flatford Swamp, Warm Mineral Springs, and the lower Myakka River estuary. Much of the watershed has been preserved from development through the acquisition and maintenance of publicly owned lands. Significant publicly owned lands in the Myakka Basin include Myakka State Park, Pineland Reserve, Carlton Reserve, and SWFWMD lands.

1.3 Myakka Basin 303(d) Listed Segments

The following table lists Myakka Basin 303(d) listed waterbodies based on Florida DEP 1998 303(d) list.

	Myakka River (Lower)	Myakka River (Upper)	Upper Myakka Lake	Owen Creek	Deer Prairie Slough	Mud Lake Slough	Warm Mineral Springs	Big Slough & (Myakka-hatchee Creek)
DO		X		X	X	X		X
Nutrients	X	X		X	X	X	X	X
BOD					X			
Coliform		X		X		X		X
Biological Habitat			X					
Turbidity		X		X		X		
TSS		X		X		X		

These listed segments are identified on a watershed basis in Figure 1.1 with delineation provided by FDEP.

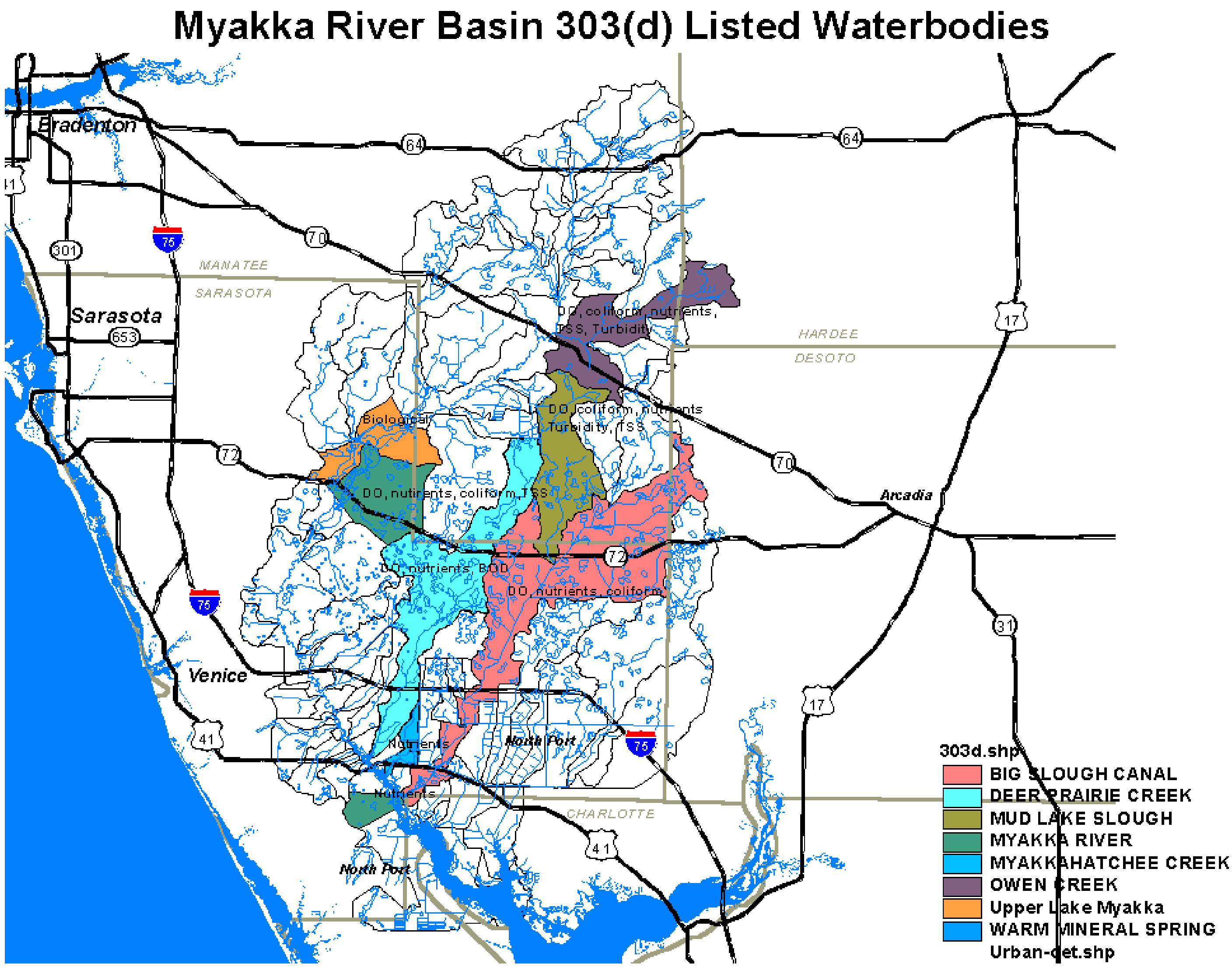

Figure 1.1 – Myakka Basin 1998 303(d) listed segments as watersheds

2 Owen Creek Basin TMDLs

2.1 Introduction

Owen Creek is a Class III freshwater which was placed on FDEP=s 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants listed were identified as dissolved oxygen, nutrients, coliforms, total suspended solids (TSS) and turbidity.

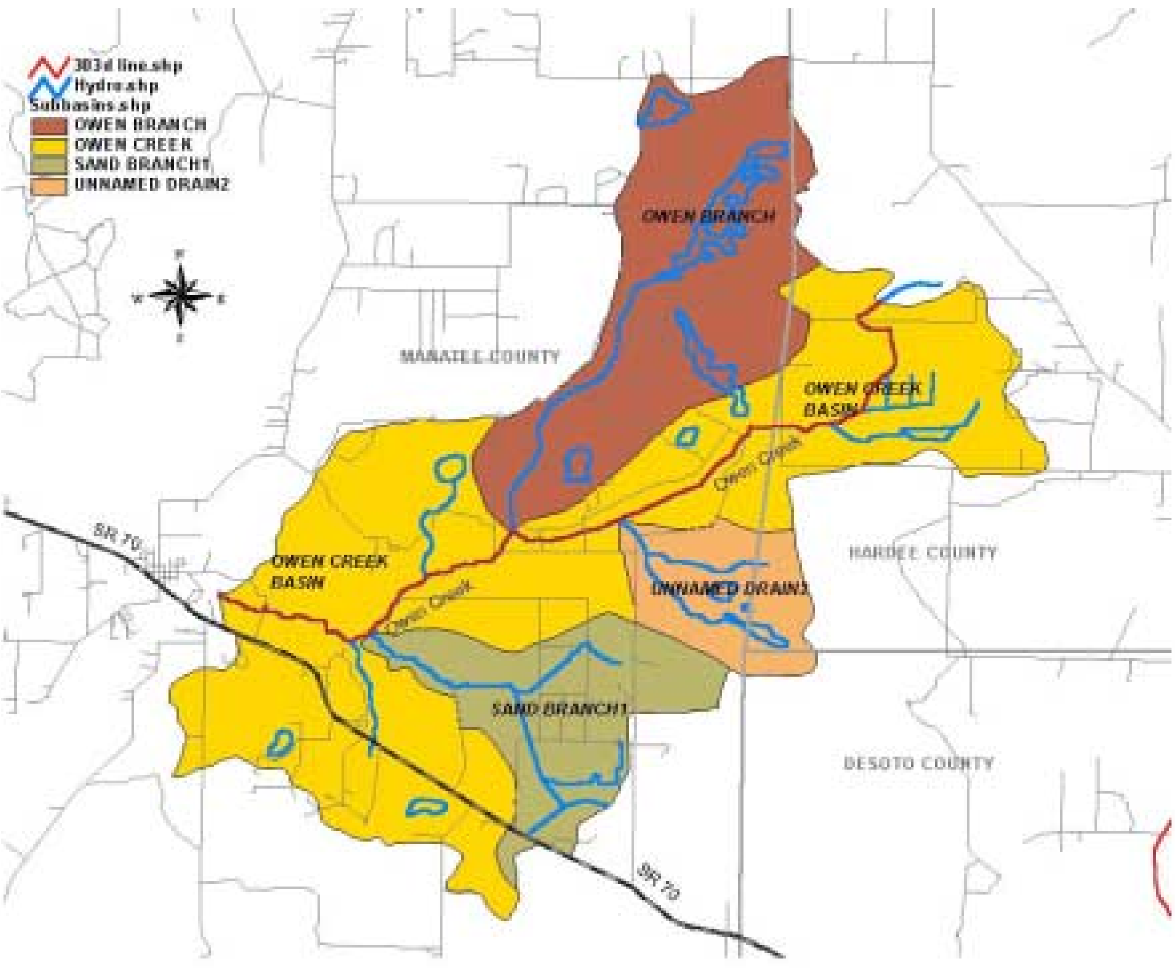

Figure 2.1 – Map of Owen Creek watershed including contributing basins and 303(d) listed segment

Owen Creek basin is mapped in Figure 2.1. Including contributing subbasins, Owen Creek drains approximately 9000 hectares at its confluence with the Myakka River. Owen Creek intermittently flows, and frequently contains zero flow, especially during times of drought.

2.2 TMDL Endpoint and Water Quality Assessment

2.2.1 Dissolved Oxygen

One of the most important considerations in protecting the designated use of a stream is the ability of the stream to maintain an adequate dissolved oxygen concentration at a level necessary to protect the aquatic and benthic life. Dissolved oxygen concentrations in stream are controlled by atmosphere reaeration, photosynthesis, plant and animal respiration, sediment oxygen demand, biochemical oxygen demand, nitrification, salinity, and temperature, among other factors. Data for Owen Creek are sparse; however, examination of available data indicated that dissolved oxygen levels at times fall below the statewide numeric criteria of 5 mg/L (See Figure 2.2). The current water quality standards for dissolved oxygen based on Florida's state-wide criteria is 5.0 mg/L in the freshwater waterbodies within the Myakka watershed. However, evidence indicates that background dissolved oxygen concentrations throughout the Myakka Basin characteristically fall below 5 mg/l due to geomorphology, hydrology, and natural processes (CHEC, 1999). The level of background dissolved oxygen in Owen Creek appears to represent DO concentrations not impacted by anthropogenic sources of oxygen demanding materials. It is unknown if anthropogenic sources of oxygen demanding materials are impacting DO concentrations in Owen Creek. Continuous monitoring conducted by FDEP personnel in Ogleby Creek indicates that DO concentrations during peak productivity periods may drop below 4 mg/l diurnally (Figure 2.3). Ogleby Creek is a potential background reference stream in the Upper Myakka River basin representing unimpacted natural DO concentrations.

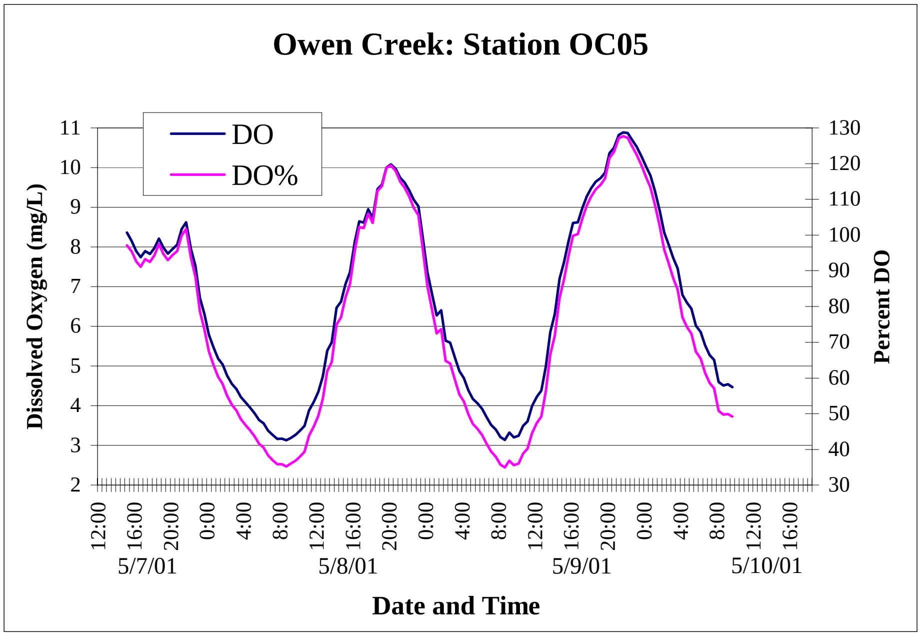

Figure 2.2 –Continuous monitoring for dissolved oxygen conducted by FDEP in Owen Creek during Spring, 2001.

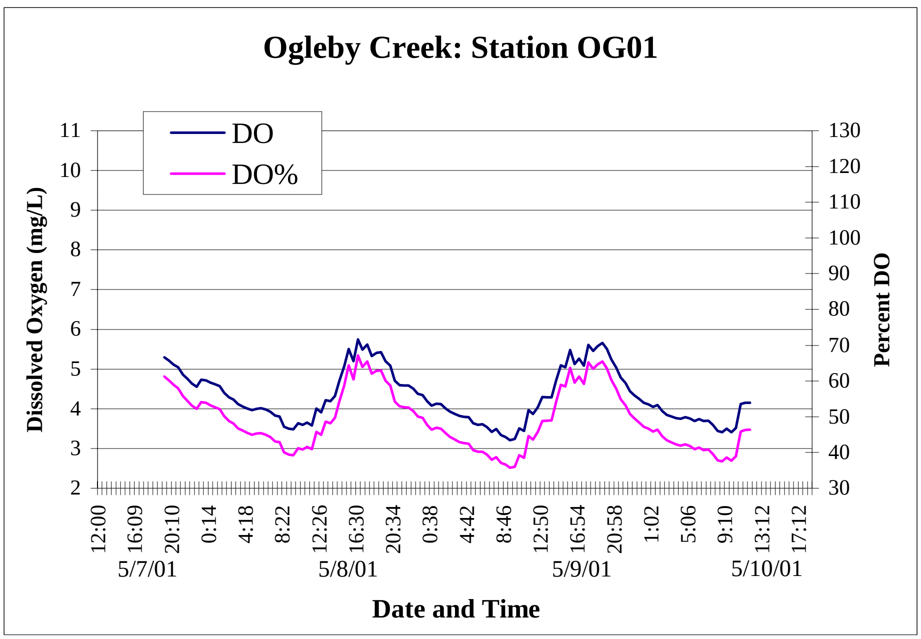

Figure 2.3 - Continuous monitoring for dissolved oxygen conducted by FDEP in Ogleby Creek during Spring, 2001.

Even though DO levels often fell below the statewide criteria of 5 mg/L, biological sampling conducted on March 24, 1999 indicated the biological community of the stream was in excellent condition. Habitat evaluation also indicated that habitat was optimal. Because of the lack of site-specific data in the Owen Creek watershed it is difficult to clearly define the most significant sources of pollutants and type of pollutants, which could lead to depressed levels of dissolved oxygen. Therefore, this TMDL will address nitrogen as the nutrient impacting the dissolved oxygen and organic enrichment levels. Nutrient enrichment due to nitrogen loading may lead to the development of aquatic vegetation and algal production, which yields large diurnal swings in DO, as exhibited throughout the Myakka Watershed. Therefore the TMDL for nitrogen will address the nutrient and low dissolved oxygen listings. Because of the limited amount of data available for assessing the impact of nutrient enrichment in the Owen Creek Watershed, additional data collecting and analysis may be required in the future to better focus the development of a TMDL.

Because the biological sampling and habitat evaluation didn’t indicate an actual impairment, the appropriate water quality target for dissolved oxygen during the initial phase of this TMDL is to maintain the current total nitrogen loading. During this time, FDEP will have a chance to develop site-specific water quality criteria that evaluate and identify appropriate background levels for nutrients and its impact on dissolved oxygen. Without these criteria, the Agency cannot determine whether dissolved oxygen concentrations are below or above background natural concentrations.

2.2.2 Nutrients

The listing for nutrients in Florida’s 1998 303(d) list was based on the fact that the median level of observed phosphorous and nitrogen concentrations exceeded the screening levels presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. In order to keep phosphorous concentrations close to natural background conditions, total nitrogen loading will be the endpoint of this and all Myakka Basin nutrient TMDLs.

2.2.3 Coliform

The coliform listing was based on exceedances of the statewide fecal coliform standard. The presence of coliform serves as an indicator of potential pathogen contamination. Pathogens harmful to humans include viruses, bacteria, and protozoans. The Florida 1996 305(b) report indicates that the listing was based on the two sampling events that have been conducted in the Owen Creek watershed (2000 counts/100ml and 68,000 counts/100ml, both collected by SWFWMD in 1993). Additional or follow-up monitoring has been hampered by the inability to easily obtain access to potential monitoring sites in the basin. The fecal coliform endpoint is the statewide numeric criteria whereby counts of colonies do not exceed a monthly average of $\leq$200 colonies/100ml, a maximum of 400 colonies/100ml in 10% of the samples, or a maximum of 800 colonies/100ml on any one day. The appropriate fecal coliform criterion to use as an endpoint for this TMDL is the maximum daily average standard of 800 counts/ 100 ml because data does not, and will not, exist at such a frequency to determine compliance with the other fecal coliform criteria. While the presence of significant concentrations of total and fecal coliform serve as an indicator of potential pathogen contamination, EPA recommends, as stated in federal 304(a) criteria, that states adopt more direct water quality criteria for indicators of pathogen contamination such as enterococci or E. coli (EPA, 2001).

2.2.4 Turbidity and Total Suspended Solids (TSS)

The listings for turbidity and TSS were on based on the fact that the median level for these parameters exceeded the screening levels presented in the 1996 305(b) report. There were two data points of past data associated with turbidity and TSS and the two samples were collected in 1993. One turbidity value was 32 NTU, collected August 25, 1993, and the other value was 9.4

NTU, collected March 17,1993. The mean value for TSS for these two sample events was 9 mg/L. These samples indicate the water is attaining standards for turbidity. No new turbidity or TSS data are available. Biological sampling conducted on March 24, 1999 indicated the biological community of the stream was in excellent condition. Habitat evaluation also indicated that habitat was optimal. Based on this evaluation, impairment due to turbidity or TSS does not appear to be present and a TMDL for these parameters is not warranted.

2.3 Source Assessment

Sources of pollutants are generally presumed to be directly linked to land-use activities in the Owen Creek watershed. There are no NPDES permitted point source discharges in the Owen Creek watershed.

2.3.1 Nitrogen Sources

Nitrogen loading to Owen Creek can be characterized from the following general sources; surface water, groundwater, and atmospheric deposition. Sources of nitrogen loading to Owen Creek are delineated based on an examination of land type and use, as derived from modeling. Because very limited water quality data exists in Owen Creek watershed, the modeling tool,WAMView, was run

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annua Total N Load (kg/yr)	% of Average Annual Total N Load
Rural Land in Transition	2.49	0.23	10,366.5	955.8	11322.3	8.9%
Scrub and Brushland	1.41	0.01	2,908.6	26.3	2934.9	2.3%
Hardwood Conifer Mixed	1.29	0.01	491.7	4.5	496.2	0.4%
Open Water	2.07	0.04	43.5	0.8	44.3	0.0%
Cypress	5.91	0.15	94.5	2.4	96.9	0.1%
Wetland Forested Mixed	4.99	0.10	2,741.7	53.8	2795.5	2.2%
Freshwater Marshes	6.16	0.09	3,251.7	46.4	3298.1	2.6%
Row Crops	46.69	38.42	32,635.1	26,852.3	59487.4	46.8%
Orchards	37.99	0.01	17,286.1	2.7	17288.8	13.6%
Cattle Feeding Operations	318.15	0.13	29,269.8	11.9	29281.7	23.0%
Background and Natural	-	-	9532	134	9666	7.6%
Non-Point Source	-	-	89558	27823	117380	92.4%
Total	-	-	99089	27957	127046	100.0%

with 1985-2000 rainfall and provides an estimate of annual average soluble and sediment total nitrogen loading from the Owen Creek watershed based on landuse and runoff for the period. The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the Administrative Record. According to model results, the most significant sources of total nitrogen loading include row crops, cattle feeding operations, orchards, and rural land in transition (pastures and rangeland). Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for less than 8 percent of the total nitrogen loading to Owen Creek. The annual average total nitrogen load to Owen Creek is estimated as 127,046 kg total nitrogen per year.

2.3.2 Coliform Sources

There are no NPDES permitted point sources in the Owen Creek basin. Nonpoint sources of fecal coliform in a rural setting such as Owen Creek basin may include livestock excrement from barnyards, feedlots, rangelands and uncontrolled manure storage areas. Leaking septic systems may represent another source of coliform bacteria. In addition, because of the very general nature of coliform as an indicator of the presence of pathogens, wildlife such as waterfowl may represent a significant source of coliform bacteria. Another potential nonpoint source of fecal coliform is the resuspension of bacteria indicators and pathogens in sediment (EPA, 2001). Very limited fecal coliform data in Owen Creek only permits speculation regarding sources of coliform to Owen Creek based on a coarse examination of landuse activities in the basin. Additional monitoring will be required to properly characterize sources of coliform in the Owen Creek basin.

2.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

TMDL = Σ WLAs + Σ LAs + MOS

2.4.1 Nutrients

The availability of data influences the types of TMDL development methods that the Agency can use. Ideally, extensive monitoring data would be available to establish baseline water quality conditions, pollutant source loading, and waterbody system dynamics. However, without long-term monitoring data, the Agency will have to use a combination of monitoring, analytical tools (including models), and qualitative assessments to collect information, assess system processes and responses, and make decisions (EPA Nutrient Protocol, 1999). Because the endpoint to address nutrient impairment is to maintain existing nitrogen loads as prescribed in 2.2.2, the source assessment modeling described in 2.3.1 provides the framework for predicting the existing load or average current annual loading conditions.

The TMDL endpoint for nutrient enrichment identified in section 2.2.2 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point sources discharging in the Owen Creek basin, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to Owen Creek has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. This load allocation is 127,046 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

where: WLA = zero kg/yr, LA = 127,046 kg/yr, and MOS = -6,352 kg/yr

So the **TMDL = 120,695 kg total nitrogen load /year**

2.4.2 Coliform

The appropriate fecal coliform criterion used to calculate endpoint for this TMDL, from those criteria identified in 2.2.3, is the maximum daily average standard of 800 counts/ 100 ml because data does not, and will not, exist at such a frequency to determine compliance with the other fecal coliform criteria. No mechanistic or empirical modeling tools have been developed for the Owen Creek watershed to estimate fecal coliform loading. Because only two samples for fecal coliform have been collected in this watershed, additional data is needed to evaluate impairment, conduct source assessment, and develop techniques to estimate fecal coliform loading linked to sources. In the meantime, a concentration based approach is used to allocate fecal coliform loading necessary to meet the standards.

The total maximum daily load for fecal coliform loading is being set in order to achieve the load that maintains the water quality standard expressed as a daily maximum concentration of 800 counts fecal coliform per 100 ml sample.

Because there exists very little water quality data in Owen Creek, and no obvious methodology to estimate flows in Owen Creek, it is not possible to synthesize and quantify coliform loading in this basin. Based on existing samples, a preliminary concentration-based approach is used to set the allocation for fecal coliform loading in Owen Creek. There are no NPDES permitted point sources discharging in the Owen Creek basin, and so the wasteload allocation for fecal coliform is zero pounds per day. The agency is targeting the daily maximum criteria of 800 counts/100 ml and also providing an explicit margin of safety of 10% below the criteria. Therefore, the TMDL is as follows:

TMDL = WLA + LA + MOS

WLA = zero counts per 100 ml; LA = 800 counts per 100 ml; MOS = -80 counts per 100ml

TMDL = 0 + 800 counts per 100 ml – 80 counts per 100ml = 720 counts per 100 ml

EPA regulations define the loading capacity as the greatest amount of pollutant (loadings) a waterbody can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. For Owen Creek, limited total coliform samples (2 samples) and the lack of instream flow data make it necessary to utilize the State's concentration-based numeric total coliform criterion of 800 colonies/100 mL minus a margin of safety as the loading capacity or "*other appropriate measure*".

2.4.3 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

The critical condition for fecal coliform loading to Owen Creek is accounted for by the fact that the TMDL is based on concentration applied regardless of flow or loading events in the watershed.

2.4.4 Seasonality

For the nutrient TMDL, by considering an annual average load, seasonal effects are considered. For this eco-system and climate, the effects of nutrient enrichment may assert themselves during any season.

The seasonality for fecal coliform loading to Owen Creek is accounted for by the fact that the TMDL is based on concentration applied regardless of the season.

2.5 Conclusion

TMDLs are proposed for fecal coliform and nutrients (DO) in the Owen Creek basin. The Florida statewide numeric criterion of 5 mg/l for DO will continue to apply to this watershed until a site specific criterion is developed. If a site specific criterion is not developed to assess dissolved oxygen, the next phase of this TMDL will prescribe load reductions in an attempt to meet the applicable standard. It is our estimation that there is no possible load reductions available to move the measured water parameters above a DO measurement of 5 mg/l because of the natural conditions of the watershed. Therefore, EPA would have to establish a TMDL such that no anthropogenic oxygen demanding material is allowed to enter the waterbody because the TMDL is designed by regulation to reduce any pollutant loading to achieve water quality standards. TMDLs are not proposed to address turbidity or total suspended solids loading. The existing data indicates the basin is attaining standards for turbidity and TSS so no TMDL is needed for these parameters. Follow-up monitoring, public participation, and implementation for Owen Creek TMDLs are presented in Section 9.

3 Myakka River (Upper Segment including Upper Lake Myakka) Basin TMDLs

3.1 Introduction

A segment of the Myakka River between Upper Lake Myakka and Lower Lake Myakka was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. This waterbody is a Class I freshwater which is also designated as an Outstanding Florida Water- Wild and Scenic River. No degredation in water quality from the time of designation is allowed in such a waterbody other than that allowed in Florida Rule 62-4.242(2) and (3) F.A.C. (FDEP, 1996). The pollutants listed were dissolved oxygen, nutrients, coliforms, and total suspended solids. Upper Lake Myakka was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. Upper Lake Myakka is also a Class I freshwater with an Outstanding Florida Water- Wild and Scenic River designation. Figure 3.1 displays listed segments and their relative location to the upper Myakka River drainage basin.

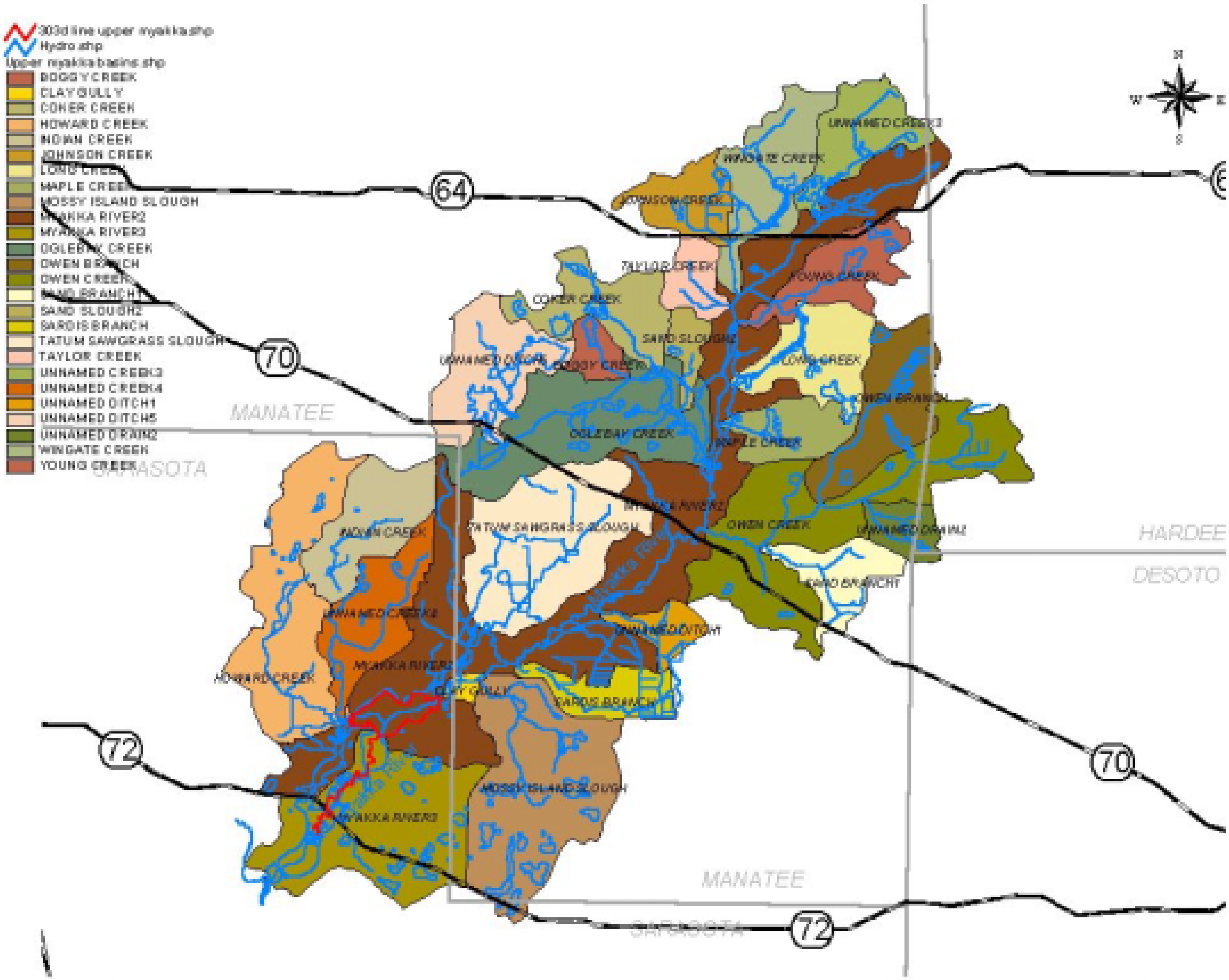

Figure 3.1 Map of upper Myakka River watershed including contributing basins and upper Myakka River and Upper Lake Myakka 303(d) listed segments

3.2 TMDL Endpoint and Water Quality Assessment

3.2.1 Upper Lake Myakka

The listing of Upper Lake Myakka was based on the fact that a bioassessment conducted in 1979 - 1980 indicated impairment. No water quality data specific to this waterbody was cited. The 1996 305(b) report states that Upper Lake Myakka is eutrophic, with dense mats of hydrilla and water hyacinth and low concentrations of dissolved oxygen.

No specific parameter of concern has been identified, however based on statements made in the 305(b) report, low dissolved oxygen may be the most likely issue of concern for the biota. Future study is recommended to confirm the status of the biological community and determine if actual water quality exceedances are present. Because no pollutant has been identified that might be causing or contributing to biological impairment, the TMDL for the upper Myakka River is being relied upon to address any possible impairments to Upper Lake Myakka. From an adaptive management perspective, Upper Lake Myakka should qualitatively benefit from the development of the upper Myakka River total nitrogen TMDL to address nutrient enrichment in this stream segment.

3.2.2 Myakka River (Upper Segment in State Park)

3.2.2.1 Nutrients

The listing of nutrients in Florida’s 1998 303(d) list was based on the fact that the median level of observed phosphorous concentrations exceeded the screening levels presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. In order to keep phosphorous concentrations close to natural background conditions, total nitrogen loading will be the endpoint of this and all Myakka Basin nutrient TMDLs.

A report prepared for SWFWMD in 1996 determined that there were no long-term trends in total nitrogen concentration apparent in the Myakka River at the USGS Sarasota gauging site (Coastal Environmental, Inc., 1996). A report prepared for the Charlotte Harbor NEP assessed long-term trends in water quality the Myakka River at the USGS monitoring station in the listed freshwater Myakka River segment. Based on data collected from 1970-1998, this study concludes that annual average and annual minimum total phosphorus concentrations showed significant increasing trends, as did annual ammonia concentrations (CHEP, 1999). This report did not find any trend in TKN concentrations, and nitrate total nitrogen concentrations were not considered. The report indicates that a highly significant increasing trend in minimum monthly stream discharge and specific conductance, concluding that groundwater inputs increased significantly during the years 1970-1998.

Biological sampling conducted by FDEP in May 2001 resulted in an excellent Stream Condition Index bioassessment score for this segment. A rapid bioreconnaissance conducted at the same time indicated a healthy score. Preliminary results from a rapid bioreconnaissance (BioRecon) sample collected October 2001 indicated impairment at the location. The habitat evaluation scored the site as suboptimal with comments that the area had lentic characteristics, with a broad marsh floodplain with no trees on the right bank. Additional monitoring should be conducted to verify the impairment based on the most recent rapid BioRecon.

3.2.2.2 Dissolved Oxygen

Examination of available data indicated that dissolved oxygen levels at times fall below the statewide numeric criteria of 5 mg/L in the Myakka River between Upper Lake Myakka and Lower Lake Myakka. An examination of dissolved oxygen data collected between 1978 and 1998 indicated no significant trend in annual minimum, annual mean, or annual maximum dissolved oxygen concentration (CHEC, 1999). The current water quality endpoint for dissolved oxygen based on Florida's statewide criteria would be 5.0 mg/L in the freshwater waterbodies within the Myakka watershed. However, evidence indicates that background dissolved oxygen concentrations throughout the Myakka Basin characteristically fall below 5 mg/l due to geomorphology, hydrology, and natural processes (CHEC, 1999). The level of background dissolved oxygen in the Myakka River appears to represent DO concentrations not impacted by anthropogenic sources of oxygen demand or supply. It is unknown if anthropogenic sources of oxygen demanding substances are impacting DO concentrations to other than background levels in the Myakka River because baseline or reference conditions have not been officially established. However, continuous monitoring conducted by FDEP personnel in Ogleby Creek indicates that DO concentrations during peak productivity periods may drop below 4 mg/l diurnally, and Ogleby Creek is a potential background reference stream in the Upper Myakka River basin representing unimpacted natural DO concentrations. Therefore, it appears that a site-specific water quality criteria for DO would need to be developed for the upper segment of the Myakka River.

Because the biological sampling and bioreconnaissance didn't conclusively indicate an actual impairment, the appropriate water quality target for dissolved oxygen during the initial phase of this TMDL is to maintain the current total nitrogen loading. During this time, FDEP will have a chance to develop site-specific water quality criteria that evaluates and identifies appropriate background levels for dissolved oxygen and the impacts of nutrients on DO levels. Without these criteria, the Agency cannot determine whether dissolved oxygen concentrations are below or above background natural conditions.

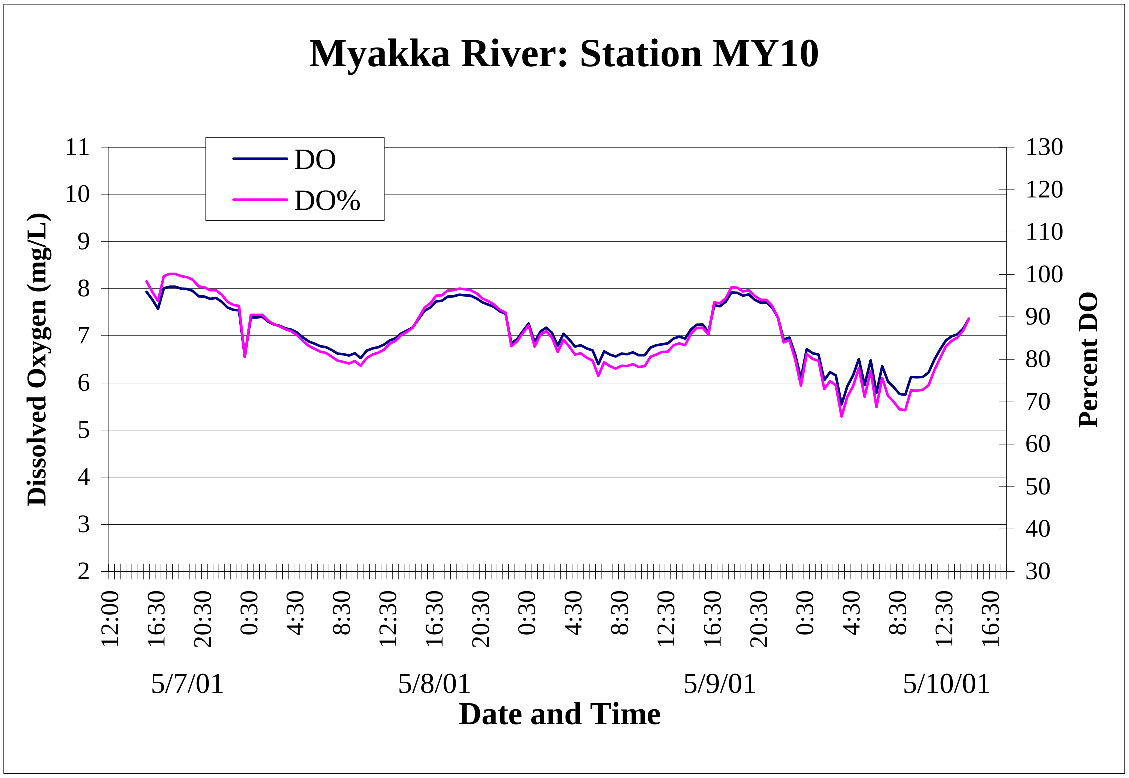

Figure 3.2 Continuous monitoring for dissolved oxygen conducted by FDEP in the listed freshwater segment of the Myakka River at State Road 72 during Spring, 2001

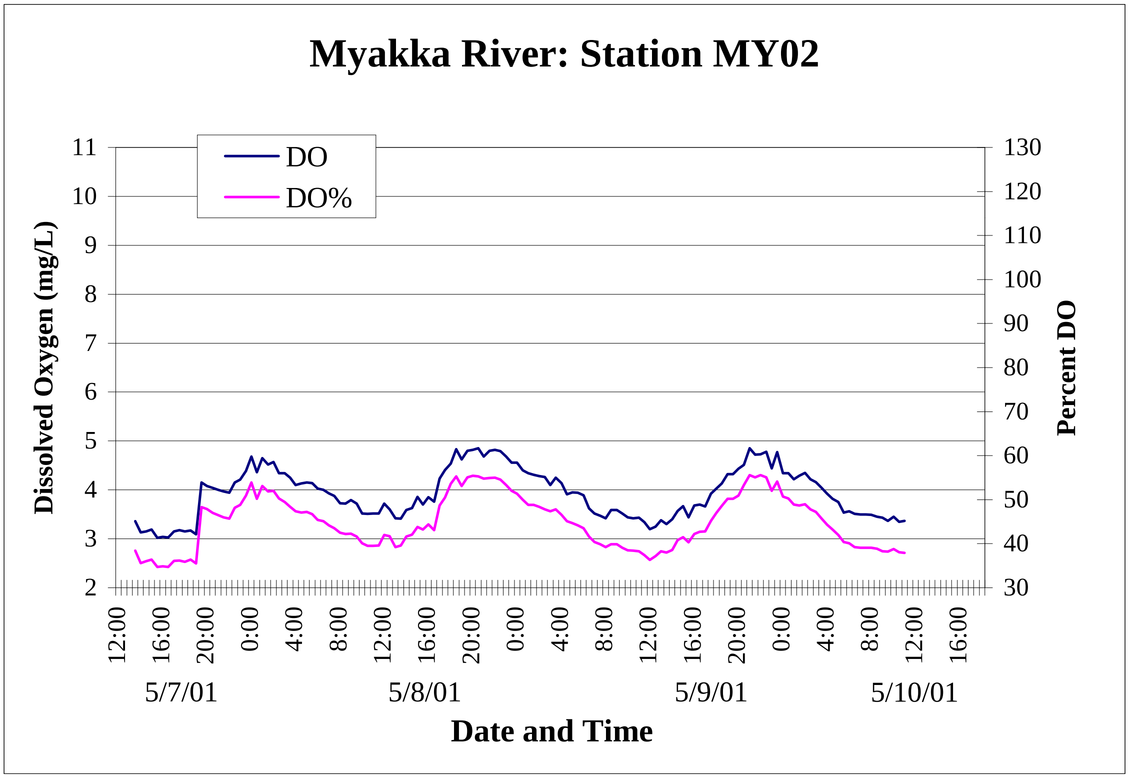

Figure 3.3 Continuous monitoring for dissolved oxygen conducted by FDEP in the Myakka River at reference site above Flatford Swamp during Spring, 2001

3.2.2.3 Coliform

The coliform listing was based on exceedances of the statewide total coliform standard. Figure 3.4 plots SWFWMD total coliform sampling at 4 locations throughout the upper Myakka River basin including a site within the coliform-impaired segment of the upper Myakka River. Exceedances of the daily maximum target occur throughout the basin, upstream of the listed segment. The total coliform endpoint is the most protective of the following statewide numeric criteria: monthly average of $\leq$1000 colonies/100ml, maximum of 1000 colonies/100ml in 20% of samples in one month, or maximum of 2400 colonies/100ml on any one day. The appropriate total coliform criterion to use as an endpoint for this TMDL is the maximum daily average standard of 2,400 counts/ 100 ml because data does not, and will not, exist at such a frequency to determine compliance with the other fecal coliform criteria.

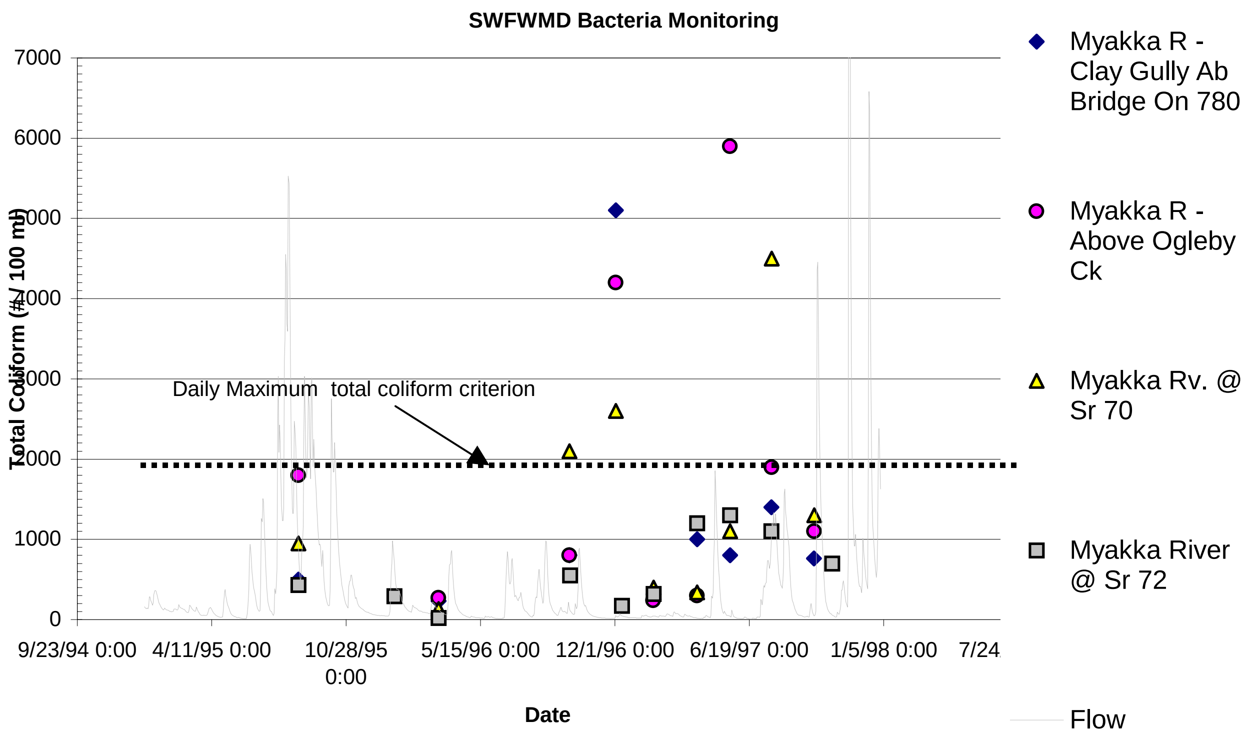

Figure 3.4 – SWFWMD total coliform monitoring results in the upper Myakka River basin.

3.2.2.4 Total Suspended Solids

The listing for total suspended solids (TSS) was based on the fact that the median levels for this parameter exceeded the screening level presented in the 1996 305(b) report. However, evaluation of past and current data associated with this parameter indicated that water quality criteria were not exceeded. The mean value of TSS for this site reported in the 1996 305(b) report was 10 mg/L. Results from three sampling events conducted in May and July 2001 produced TSS values ranging from 4 mg/L to 15 mg/L with a mean of 6.7 mg/L. Associated turbidity readings were very low ranging from 1.5 NTU to 4.6 NTU. These samples indicate the water is attaining standards for turbidity. Based on the low levels of TSS and turbidity, and the positive biological evaluations, impairment due to turbidity or TSS does not appear to be present and a TMDL for these parameters is not necessary.

3.3 Source Assessment

Sources of pollutants are generally presumed to be directly linked to land-use activities in the Myakka River (upper segment) watershed. There are no NPDES permitted point source discharges in this watershed permitted to discharge pollutants indicated as endpoints in the previous section.

3.3.1 Nutrients

Nitrogen loading to the Myakka River's freshwater listed segment can be characterized from the following general sources; surface water, groundwater, and atmospheric deposition. Sources of nitrogen loading to this segment are derived based on an examination of land type and use, as calculated from modeling. The modeling tool, WAMView, was run with 1985-2000 rainfall and provides an estimate of annual average soluble and sediment total nitrogen loading from the Owen Creek watershed based on landuse and runoff for the period. The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the Administrative Record. According to model results, the most significant sources of total nitrogen loading is row crops, representing over half of the total nitrogen loading in the basin. The remaining significant sources include a mixture of rural land in transition (pastures and rangeland), freshwater marshes, and scrub and brushland. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for less than 24 percent of the total nitrogen loading to the Myakka River at the listed segment. The annual average total nitrogen load to this segment from all upstream sources is estimated as 1,079,474 kg total nitrogen per year.

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Low Density Residential	1.58	0.61	5,913.3	2,266.4	8179.7	0.8%
Commercial and Services	9.53	5.73	5,938.1	3,567.3	9505.4	0.9%
Rural Land in Transition	1.99	0.14	64,408.2	4,432.9	68841.1	6.4%
Scrub and Brushland	1.65	0.02	74,651.3	800.2	75451.5	7.0%
Hardwood Conifer Mixed	1.22	0.02	8,776.0	169.3	8945.3	0.8%
Coniferous Plantations	1.48	0.03	169.2	3.8	173.0	0.0%
Open Water	1.61	0.05	3,421.7	100.9	3522.6	0.3%
Bay Swamps	4.39	0.56	2,261.3	285.6	2546.9	0.2%
Mixed Wetland Hardwoods	2.72	0.09	100.7	3.5	104.2	0.0%
Cypress	4.99	0.17	2,246.1	78.5	2324.6	0.2%
Wetland Forested Mixed	4.25	0.10	50,065.1	1,150.7	51215.8	4.7%
Freshwater Marshes	5.86	0.08	110,489.4	1,535.3	112024.7	10.4%
Barren Land	7.24	0.88	629.8	76.8	706.6	0.1%
Transportation Corridors	5.48	2.56	2,541.9	1,189.0	3730.9	0.3%
Medium Density Residential	2.99	2.04	1,877.7	1,284.2	3161.9	0.3%
High Density Residential	4.73	4.34	2,799.1	2,566.1	5365.2	0.5%
Industrial	11.81	4.38	4,333.5	1,606.5	5940.0	0.6%
Row Crops	58.93	35.15	341,935.0	203,945.7	545880.7	50.6%
Peach and Pecan Orchards	37.55	0.02	101,570.6	55.5	101626.1	9.4%
Cattle Feeding Operations	320.39	0.13	43,893.2	17.2	43910.4	4.1%
Tree Nurseries	140.96	0.04	7,611.9	2.1	7614.0	0.7%
Dairies	29.80	0.07	2,145.9	4.8	2150.7	0.2%
Aquaculture	3.85	1.35	200.2	70.4	270.6	0.0%
Undeveloped Urban Land	1.17	0.34	10,716.1	3,087.8	13803.9	1.3%
Mining	1.85	0.07	1,427.7	50.2	1477.9	0.1%
Background and Natural	-	-	252181	4128	256309	23.8%
Non-Point Source	-	-	597942	224223	822165	76.2%
Total Load	-	-	850123	228351	1078474	100.0%

3.3.2 Coliform

Sources of coliform pollutants are generally presumed to be directly linked to land-use activities in the entire upper Myakka watershed. Agriculture and manure spreading activities, cattle access to streams, as well as natural sources such as waterfowl are prevalent in this watershed.

3.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

TMDL = Σ WLAs + Σ LAs + MOS

3.4.1 Nutrients

The availability of data influences the types of methods that developers can use. Ideally, extensive monitoring data are available to establish baseline water quality conditions, pollutant source loading, and waterbody system dynamics. However, without long-term monitoring data, the developer will have to use a combination of monitoring, analytical tools (including models), and qualitative assessments to collect information, assess system processes and responses, and make decisions (EPA Nutrient Protocol, 1999). Because the endpoint to address nutrient impairment is to maintain existing nitrogen loads as prescribed in 3.2.2.1, the source assessment modeling described in 3.3.1 provides the framework for predicting the existing load or average current annual loading conditions.

The TMDL endpoint for nutrient enrichment identified in section 3.2.2.1 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point sources discharging in the Myakka River basin with allocations for the pollutants subject to these TMDLs, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to the Myakka River upper listed segment has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. This load allocation is 1,079,474 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

WLA = zero kg/yr, LA = 1,079,474 kg/yr, and MOS = -53,974 kg/yr

TMDL = 1,025,500 kg total nitrogen load / year

3.4.2 Coliform

The appropriate total coliform criterion used to calculate endpoint for this TMDL, from those criteria identified in 3.2.2.3, is the maximum daily average standard of 2,400 counts/ 100 ml because data does not, and will not, exist at such a frequency to determine compliance with the other total coliform criteria. No mechanistic or empirical modeling tools have been developed for the upper Myakka River to estimate total coliform loading. For the total coliform TMDL, as described in **Error! Reference source not found.**, the total maximum daily load for total coliform for the upper Myakka River Basin (all basins draining to the impaired segment identified as upper Myakka River) is the load that results in total coliform concentrations equal to or less than 2400 counts/100 ml. In other words, the total maximum daily load for total coliform loading is being set in order to achieve the load that maintains the water quality standard expressed as a daily maximum concentration of 2,400 counts total coliform per 100 ml sample.

Based on existing samples, a concentration-based approach was used to set the allocation for total coliform loading in the upper Myakka River. There are no NPDES permitted point sources discharging in the upper Myakka River, and so the wasteload allocation for total coliform is zero counts/100 ml. The Agency is targeting the daily maximum criteria of 2,400 counts/100 ml and also providing an explicit margin of safety of 10% below that criteria. Therefore, the TMDL is as follows:

TMDL = WLA + LA + MOS

where: WLA = zero counts/100 ml, LA = 2,400 counts/100 ml. MOS = -240 counts/100ml

TMDL = 0 + 2,400 counts/100 ml – 240 counts/100ml = 2,160 counts/100 ml

EPA regulations define the loading capacity as the greatest amount of pollutant (loadings) a waterbody can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. For upper Myakka River, limited total coliform samples and the lack of well defined source characterization make it necessary to utilize the State's concentration-based numeric total coliform criterion of 2,400 colonies/100 mL minus a margin of safety as the loading capacity or "*other appropriate measure*".

3.4.3 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would likely result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

The critical condition for total coliform loading to Upper Myakka River is accounted for by the fact that the TMDL is based on concentration applied regardless of flow or loading events in the watershed.

3.4.4 Seasonality

A TMDL must provide consideration for seasonal loading variation to insure that proposed load reductions would result in attainment of water quality standards.

The nutrient TMDLs considers data collected under a variety of flow conditions. For this eco-system and climate, the effects of nutrient enrichment may assert themselves during any season.

The seasonality for total coliform loading to Upper Myakka River is accounted for by the fact that the TMDL is based on concentration applied regardless of the season.

3.5 Conclusion

TMDLs are proposed for total coliform as well as total nitrogen (DO). The total nitrogen TMDL for upper Myakka River basin is believed to qualitatively address the Upper Lake Myakka listing for biological habitat impairment based on adaptive management principles. The total coliform TMDL prescribes the concentration necessary to achieve the water quality standard.

The Florida statewide numeric criterion of 5 mg/l for DO will continue to apply to this watershed until a site specific criterion is developed. If a site specific criterion is not developed to assess dissolved oxygen, the next phase of this TMDL will prescribe load reductions in an attempt to meet the applicable standard. It is our estimation that there is no possible load reductions available to move the measured water parameters above a DO measurement of 5 mg/l because of the natural conditions of the watershed. Therefore, EPA would have to establish a TMDL such that no anthropogenic oxygen demanding material is allowed to enter the waterbody because the TMDL is designed by regulation to reduce any pollutant loading to achieve water quality standards. TMDLs are not proposed to address turbidity or total suspended solids loading. The existing data indicates the basin is attaining standards for turbidity and TSS so no TMDL is needed for these parameters.

Implementation, follow-up monitoring recommendations, and public participation is discussed in Chapter 9.

4 Deer Prairie Slough Basin TMDLs

4.1 Introduction

Deer Prairie Slough is a Class III freshwater that was placed on FDEP=s 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants listed were identified as dissolved oxygen, nutrients, and biochemical oxygen demand (BOD). Deer Prairie Slough contains an estuarine component near its confluence with the Myakka River, and a tide gate regulates this component. Flows in the freshwater portion of Deer Prairie Slough commonly reach zero cfs, as large pools develop of stagnant water during times of drought. A significant remediation project exists in this basin that should return Dear Prairie Slough to its natural condition. The Deer Prairie Slough Restoration Project is a Sarasota County project supported with funding from the Charlotte Harbor NEP as well as SWFWMD to restore the historic hydrology and ecology of Deer Prairie Slough (Sarasota County, 2001). As a remediation project that should restore ditched channels back to wetlands and restore habitat including native species, this project is expected to have a beneficial impact on water quality.

4.2 TMDL Endpoint and Water Quality Assessment

Examination of data for Deer Prairie Slough indicated that dissolved oxygen levels at times fall below the statewide numeric criteria of 5 mg/L. The listing of nutrients was based on the fact that the median level of phosphorous exceeded the screening level presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations, and in blackwater streams color limitation exists. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna.

There is no numeric standard for BOD in Florida. The narrative standard for BOD states that BOD should not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to create nuisance conditions.

The endpoints for the parameters of concern are based primarily on Florida=s water quality standards. The nutrient levels and BOD levels should be established so that the dissolved oxygen is maintained at the appropriate level. Appropriate water quality criteria should be developed to protect this basin from excessive sources of anthropogenic oxygen demand loading. Florida’s existing statewide numeric criterion of 5 mg/l for DO should not apply to waterbodies where natural conditions prohibit the maintenance of such a criterion, and FDEP rules provide for this exception. Deep Prairie Slough, being a sub-tropical basin dominated by bottomland swamps and marshes, certainly classifies as such a system whereby DO concentrations should frequently, naturally be less than 5 mg/l. Biological indicators provide a better endpoint for assessment purposes for Deer Prairie Slough, and these indicators should be site specific based on reference conditions.

4.3 Source Assessment

Deer Prairie Slough is a largely rural basin dominated by pine flatwoods, freshwater marshes, and bottomland swamps. Large tracts of this basin are preserved and/or are being restored as public lands. The northern sector of the basin contains pasture land, and there exists a small amount of low-density residential development in the southern portion of the basin.

Figure 4.1 - Deer Prairie Slough @ SR 72

The modeling tool, WAMView, was run with 1985-2000 rainfall and provides an estimate of annual average soluble and sediment total nitrogen loading from the Owen Creek watershed based on landuse and runoff for the period The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Low Density Residential	1.78	0.48	133.4	35.8	169.2	0.6%
Rural Land in Transition	1.46	0.18	318.8	39.3	358.1	1.3%
Scrub and Brushland	1.87	0.02	6,825.6	68.4	6894.0	24.3%
Hardwood Conifer Mixed	1.29	0.02	1,032.5	13.9	1046.3	3.7%
Open Water	2.07	0.05	148.9	3.9	152.8	0.5%
Bay Swamps	4.83	0.22	217.5	9.7	227.2	0.8%
Wetland Forested Mixed	4.91	0.10	3,332.4	64.6	3396.9	12.0%
Freshwater Marshes	6.51	0.07	15,452.0	173.4	15625.4	55.0%
Transportation Corridors	6.57	2.27	151.0	52.1	203.2	0.7%
Industrial	17.63	2.39	211.5	28.7	240.2	0.8%
Undeveloped Urban Land	1.99	0.11	81.4	4.4	85.8	0.3%
Background and Natural	-	-	27009	334	27343	96.3%
Non-Point Source	-	-	896	160	1056	3.7%
Total	-	-	27905	494	28399	100.0%

Administrative Record. According to model results, the most significant sources of total nitrogen loading include freshwater marshes, scrub and brushland, and wetland forested (mixed). These land types all represent types with minimal anthropogenic impact. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for more than 96% of the total nitrogen loading to Deer Prairie Slough. The annual average total nitrogen load to Deer Prairie Slough is estimated as 28,399 kg total nitrogen per year.

4.4 Conclusion

Because a significant water quality remediation project is underway that is expected to enhance water quality and allow Dear Prairie Slough to meet its designated use and that all existing information would lead us to conclude that nay impairments to Dear Prarie Slough would have been caused by hydromodification and not pollutant loading, a TMDL for nutrients is not necessary for Deer Prairie Slough at this time. TMDLs are only necessary to restrict pollutant loading that causes impairment. By restoring native vegetation and hydrology to this basin, hydraulic retention will increase thereby providing the natural benefit of nutrient retention, sediment retention, and an expected reduction in the loading of oxygen demanding substances to the main channel of Dear Prairie Slough itself. Follow-up monitoring is suggested to assess the effectiveness of the remediation project and to assure that implementation of this remediation project will result in the long-term goal of Deer Prairie Slough meeting its designated uses. Follow-up monitoring goals, are recommended in Section 9.2.4.

5 Mud Lake Slough Basin TMDLs

5.1 Introduction

Mud Lake Slough is a Class III freshwater that was placed on FDEP=s 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants listed were identified as dissolved oxygen, nutrients, coliforms, turbidity and total suspended solids.

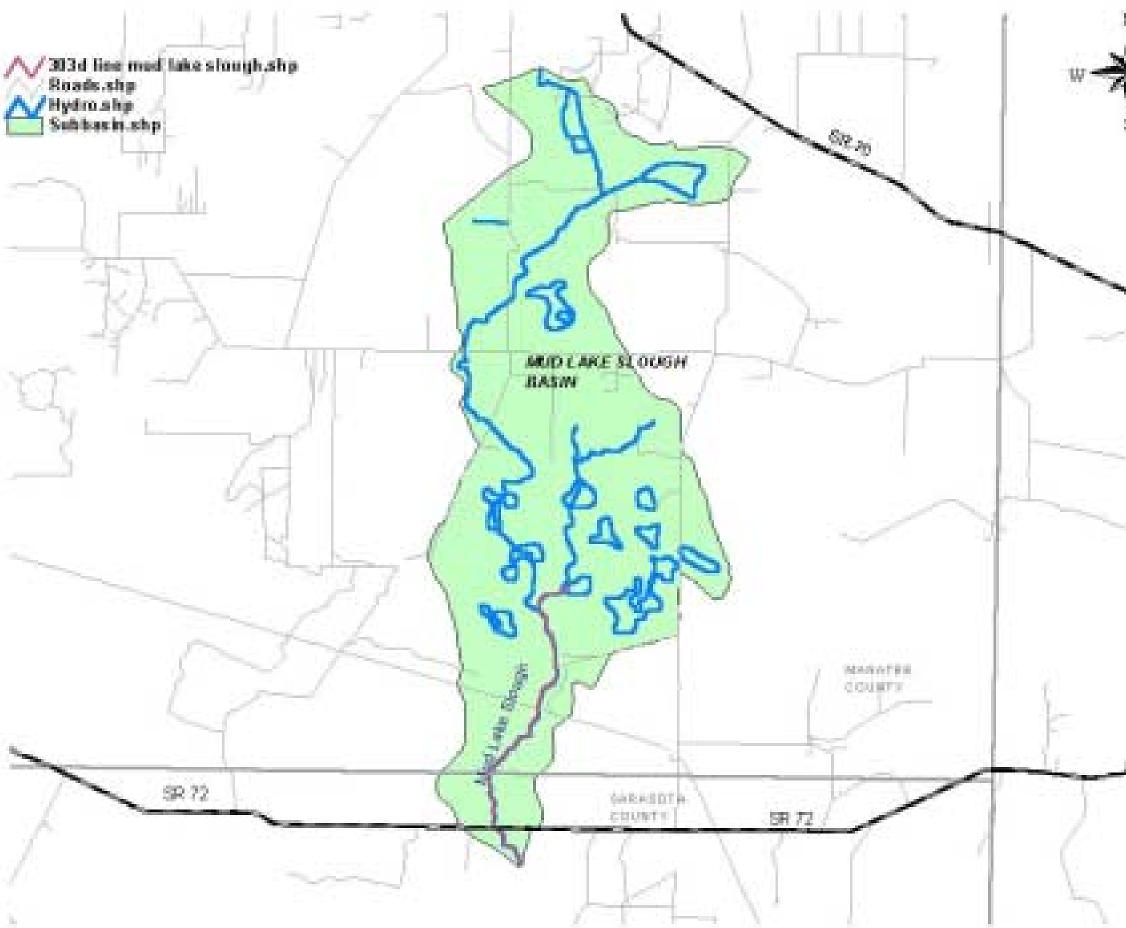

Figure 5.1 Map of Mud Lake Slough watershed including 303(d) listed segment

Mud Lake Slough basin is mapped in Figure 5.1. Mud Lake Slough drains approximately 4600 hectares at its confluence with Big Slough. The slough intermittently flows, and frequently contains zero flow, especially during times of drought

5.2 TMDL Endpoint and Water Quality Assessment

5.2.1 Dissolved Oxygen

Examination of data for Mud Lake Slough indicated that dissolved oxygen levels at times fall below the statewide numeric criteria of 5 mg/L. The current water quality endpoint for dissolved oxygen based on Florida's statewide criteria would be 5.0 mg/L in the freshwater waterbodies within the Myakka watershed. However, evidence indicates that background dissolved oxygen concentrations throughout the Myakka Basin characteristically fall below 5 mg/l due to geomorphology, hydrology, and natural processes (CHEC, 1999). The level of background dissolved oxygen in Mud lake Slough represents DO concentrations not impacted by anthropogenic sources of oxygen demand or supply. It is unknown if anthropogenic sources of oxygen demanding substances are impacting DO concentrations in Mud Lake Slough. Continuous monitoring conducted by FDEP personnel in Spring 2001 (Figure 5.2) shows large diurnal swings in dissolved oxygen concentrations, indicative of productive or eutrophic waterbodies.

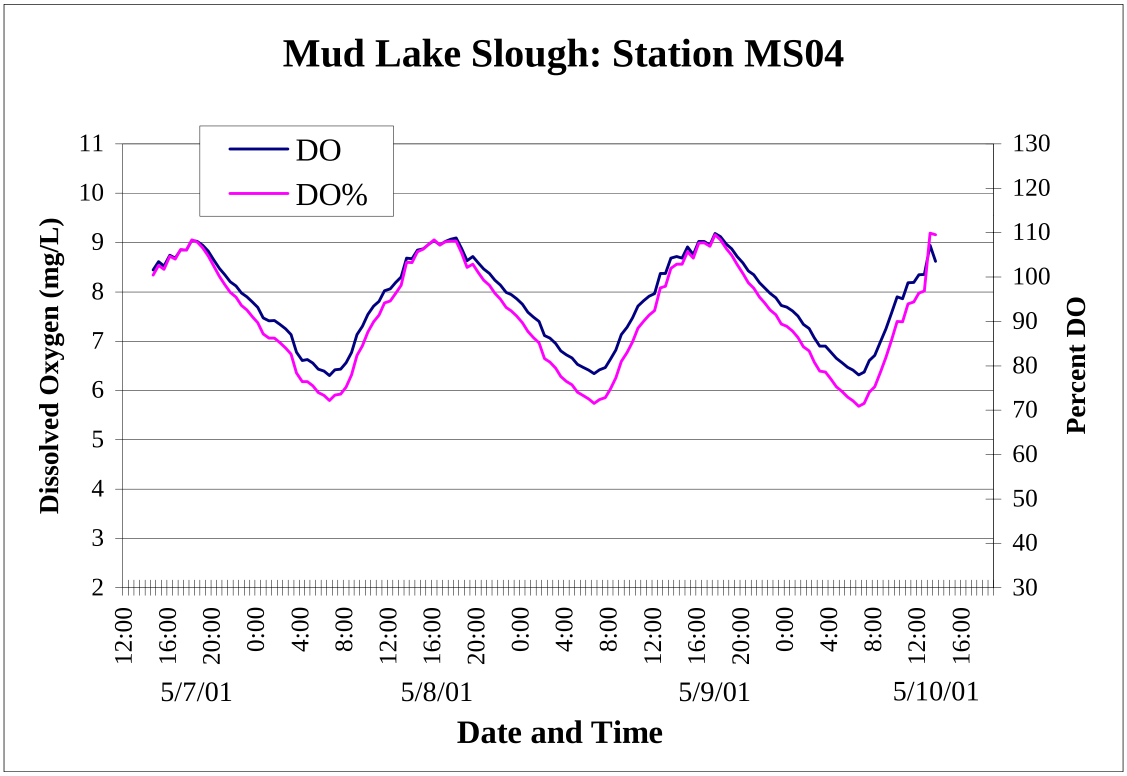

Figure 5.2 Continuous monitoring for dissolved oxygen conducted by FDEP in Mud Lake Slough during Spring, 2001

5.2.2 Nutrients

The listing of nutrients was based on the fact that the median level of phosphorous exceeded the screening level presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations, and in blackwater streams color limitation exists. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. In order to keep phosphorous concentrations close to natural background conditions, total nitrogen loading will be the endpoint of this and all Myakka Basin nutrient TMDLs.

5.2.3 Coliform

The coliform listing was based on exceedances of the statewide fecal coliform standard. The fecal coliform endpoint is the statewide numeric criteria of a monthly average of $\leq$200 colonies/100ml, a maximum of 400 colonies/100ml in 10% of the samples, or a maximum of 800 colonies/100ml on any one day. The appropriate fecal coliform criterion used to calculate endpoint for this TMDL is the maximum daily average standard of 800 counts/ 100 ml because data does not, and will not, exist at such a frequency to determine compliance with the other fecal coliform criteria.

5.2.4 Turbidity and Total Suspended Solids

The listings for turbidity and total suspended solids (TSS) were based on the fact that the median levels for these parameters exceeded screening levels presented in the 1996 305(b) report. Evaluation of past and current data associated with these parameters indicate that water quality criteria were not exceeded at a frequency to indicate impairment due to these parameters and a TMDL is not warranted.

5.3 Source Assessment

5.3.1 Nutrients

Nitrogen loading to Mud Lake Slough can be characterized from the following general sources; surface water, groundwater, and atmospheric deposition. Sources of nitrogen loading to Mud Lake Slough are derived based on an examination of land type and use, as calculated from modeling. The modeling tool, WAMView, was run with 1985-2000 rainfall and provides an estimate of annual average soluble and sediment total nitrogen loading from the Mud Lake Slough watershed based on landuse and runoff for the period The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Rural Land in Transition	2.00	0.09	5,347.3	234.9	5582.2	10.0%
Scrub and Brushland	2.08	0.02	4,085.9	40.7	4126.6	7.4%
Hardwood Conifer Mixed	1.39	0.03	379.9	8.8	388.7	0.7%
Coniferous Plantations	1.63	0.05	24.4	0.8	25.2	0.05%
Open Water	2.73	0.07	35.5	0.9	36.4	0.1%
Cypress	4.31	0.27	103.4	6.4	109.8	0.2%
Wetland Forested Mixed	4.66	0.12	1,961.1	52.2	2013.3	3.6%
Freshwater Marshes	5.95	0.11	5,140.7	95.0	5235.7	9.4%
Row Crops	35.38	65.08	11,781.8	21,671.8	33453.6	59.9%
Orchards	40.49	0.05	3,846.6	5.1	3851.7	6.9%
Cattle Feeding Operations	329.32	0.44	988.0	1.3	989.3	1.8%
Aquaculture	6.20	0.16	37.2	0.9	38.1	0.1%
Background and Natural	-	-	11731	205	11936	21.4%
Non-Point Source	-	-	22001	21914	43915	78.6%
Total	-	-	33732	22119	55851	100.0%

Administrative Record. According to model results, the most significant sources of total nitrogen loading is row crops, representing more than half of the total nitrogen loading to the basin. Other significant sources include pasture and orchards. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for less than 22 percent of the total nitrogen loading to Mud Lake Slough. The annual average total nitrogen load to Mud Lake Slough is estimated as 55,851 kg total nitrogen per year.

5.3.2 Coliform

There are no NPDES permitted point sources in the Mud Lake Slough basin. Nonpoint sources of fecal coliform in a rural setting such as Mud Lake Slough may include livestock excrement from barnyards, feedlots, rangelands and uncontrolled manure storage areas. Leaking septic systems may represent another source of coliform bacteria. In addition, because of the very general nature of coliform as an indicator of the presence of pathogens, wildlife such as waterfowl may represent a significant source of coliform bacteria. Another potential nonpoint source of fecal coliform is the resuspension of bacteria indicators and pathogens in sediment (EPA, 2001). Additional monitoring will be required to properly characterize sources of fecal coliform in the Mud Lake Slough basin.

Figure 5.3 – Photograph of Mud Lake Slough @ CR 780 (trampled banks, many cattle in area)

Figure 5.4 – Photograph of Mud Lake Slough @ SR 72

5.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

TMDL = Σ WLAs + Σ LAs + MOS

5.4.1 Nutrients

The TMDL endpoint for nutrient enrichment identified in section 5.2.2 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point sources discharging into Mud Lake Slough, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to Mud Lake Slough has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. Based on this modeling described in 5.3.1 this load allocation is 55,851 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

where: WLA = zero kg/yr, LA = 55,851 kg/yr, and MOS = -2,793 kg/yr

So the **TMDL = 53,058 kg total nitrogen load/year**

5.4.1.1 Fecal Coliform

The appropriate fecal coliform criterion used to calculate endpoint for this TMDL, from those criteria identified in 2.2.3, is the maximum daily average standard of 800 counts/100. No mechanistic or empirical modeling tools have been developed for Mud Lake Slough to estimate fecal coliform loading. Additional data is needed to evaluate impairment, conduct source assessment, and develop techniques to estimate fecal coliform loading linked to sources. In the meantime, a concentration based approach is used to estimate a fecal coliform loading necessary to meet water quality standards.

The total maximum daily load for fecal coliform loading is being set in order to achieve the load that maintains the water quality standard expressed as a daily maximum concentration of 800 counts fecal coliform per 100 ml sample.

Because there exists very little water quality data in Mud Lake Slough, and no obvious methodology to estimate flows in Mud Lake Slough, it is not possible to synthesize and quantify coliform loading in this basin. A preliminary concentration-based approach is used to set the allocation for fecal coliform loading in Mud Lake Slough. There are no NPDES permitted point sources discharging in Mud Lake Slough, and so the wasteload allocation for fecal coliform is zero pounds per day. The agency is targeting the daily maximum criteria of 800 counts/100 ml and also providing an explicit margin of safety of 10% below the criteria. Therefore, the TMDL is as follows:

TMDL = WLA + LA + MOS

where: WLA = zero counts/100ml, LA = 800 counts/100 ml, MOS = -80 counts/100ml

TMDL = 0 + 800 counts/100 ml – 80 counts/100ml = 720 counts/100 ml

EPA regulations define the loading capacity as the greatest amount of pollutant (loadings) a waterbody can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. For Mud Lake Slough, limited total coliform samples, a limited source assessment, and the lack of instream flow data make it necessary to utilize the State's concentration-based numeric total coliform criterion of 800 colonies/100 mL minus a margin of safety as the loading capacity or "*other appropriate measure*".

5.4.2 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would likely result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

The critical condition for fecal coliform loading to Mud Lake Slough is accounted for by the fact that the TMDL is based on concentration applied regardless of flow or loading events in the watershed.

5.4.3 Seasonality

A TMDL must provide consideration for seasonal loading variation to insure that proposed load reductions would result in attainment of water quality standards.

The nutrient TMDL considers data collected under a variety of flow conditions. For this eco-system and climate, the effects of nutrient enrichment may assert themselves during any season.

The seasonality for fecal coliform loading to Mud Lake Slough is accounted for by the fact that the TMDL is based on concentration applied regardless of the season.

5.5 Conclusion

A TMDL is proposed for total nitrogen/DO in the Mud Lake Slough basin to address nutrient impairment. The fecal coliform TMDL is proposed to address the coliform listing.

The Florida statewide numeric criterion of 5 mg/l for DO will continue to apply to this watershed until a site specific criterion is developed. If a site specific criterion is not developed to assess dissolved oxygen, the next phase of this TMDL will prescribe load reductions in an attempt to meet the applicable standard. It is our estimation that there is no possible load reductions available to move the measured water parameters above a DO measurement of 5 mg/l because of the natural conditions of the watershed. Therefore, EPA would have to establish a TMDL such that no anthropogenic oxygen demanding material is allowed to enter the waterbody because the TMDL is designed by regulation to reduce any pollutant loading to achieve water quality standards. TMDLs are not proposed to address turbidity or total suspended solids loading. The existing data indicates the basin is attaining standards for turbidity and TSS so no TMDL is needed for these parameters.

Follow-up monitoring, public participation, and implementation for the Mud lake Slough TMDL is presented in Section 9.

6 Big Slough Basin TMDLs

6.1 Introduction

Big Slough was placed on FDEP=s 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. Big Slough is a Class I freshwater and is designated for potable water supply. The pollutants listed were identified as dissolved oxygen, nutrients, and coliforms.

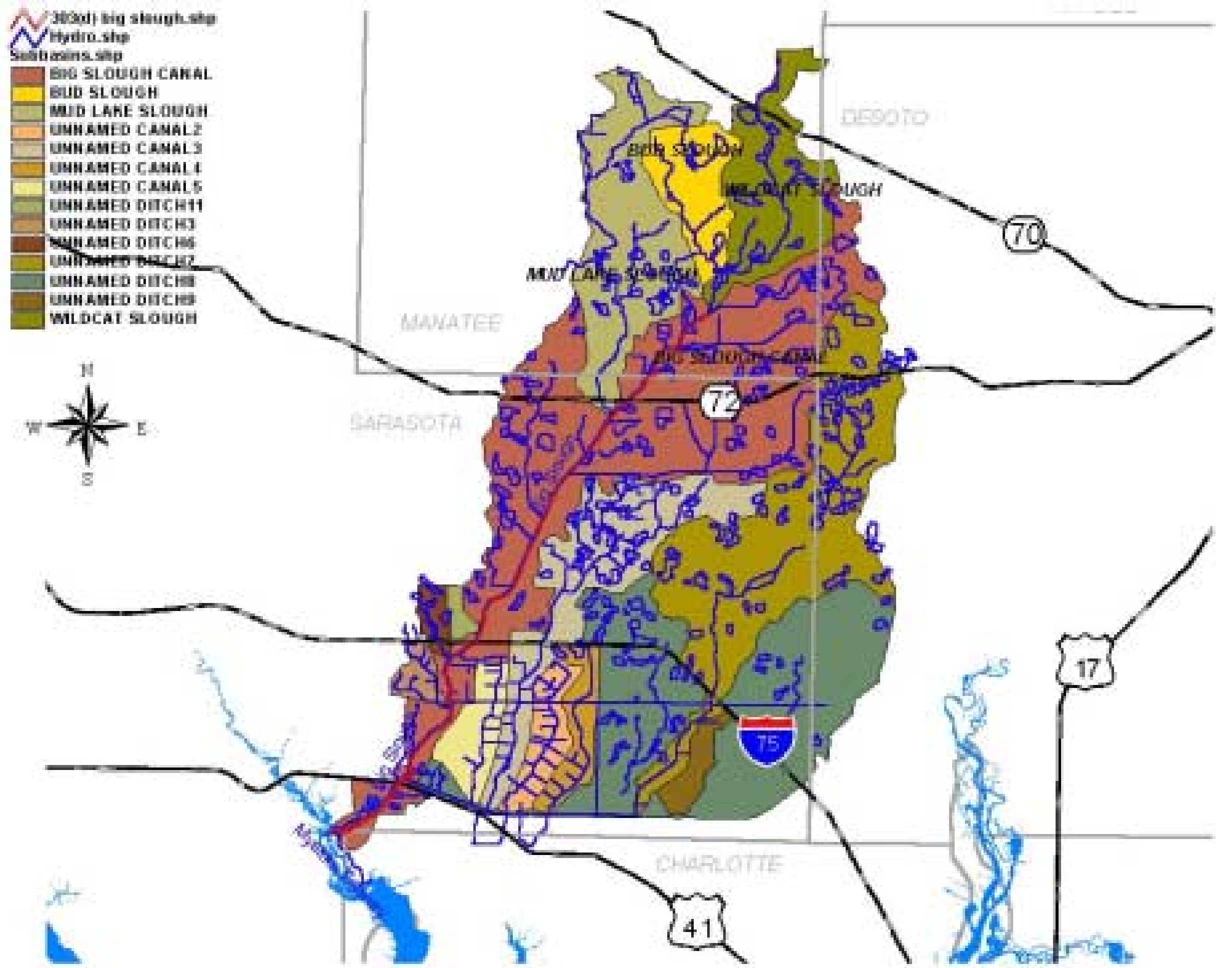

Figure 6.1 – Map of Big Slough watershed and contributing watersheds including 303(d) impaired segment of Big Slough

6.2 TMDL Endpoint and Water Quality Assessment

6.2.1 Dissolved Oxygen

Examination of data for Big Slough indicated that dissolved oxygen levels at times fall below the statewide numeric criteria of 5 mg/L. The nutrient levels should be established so that the dissolved oxygen is maintained at the appropriate level. The current water quality endpoint for dissolved oxygen based on Florida's statewide criteria would be 5.0 mg/L in the freshwater waterbodies within the Myakka watershed. However, there is evidence that background dissolved oxygen concentrations throughout the Myakka Basin characteristically fall below 5 mg/l due to geomorphology, hydrology, and natural processes (CHEC, 1999). The level of background dissolved oxygen in Big Slough appears to represent DO concentrations not impacted by anthropogenic sources of oxygen demand or supply. It is unknown if anthropogenic sources of oxygen demanding substances are impacting DO concentrations in Big Slough. Continuous monitoring conducted by FDEP personnel in Spring 2001 (Figure 6.2) shows large diurnal swings in dissolved oxygen concentrations, indicative of productive or eutrophic waterbodies. Dissolved oxygen concentrations in stream are controlled by atmosphere reaeration, photosynthesis, plant and animal respiration, sediment oxygen demand, biochemical oxygen demand, nitrification, salinity, and temperature, among other factors. It may be necessary to adaptively manage DO until site-specific criteria are developed. In the meantime, for this phase of the TMDL, the nitrogen endpoint and TMDL will address the dissolved oxygen impairment listing.

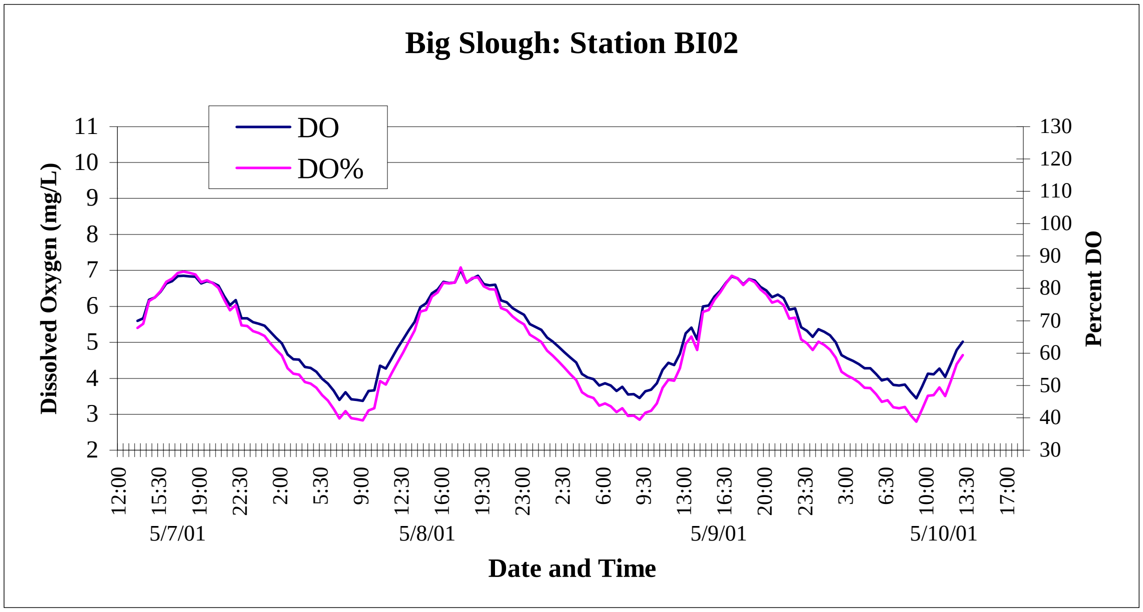

Figure 6.2 - Continuous monitoring for dissolved oxygen conducted by FDEP in Big Slough at SR 72 during Spring, 2001

6.2.2 Nutrients

The listing of nutrients in Florida's 1998 303(d) list was based on the fact that the median level of observed exceeded the screening levels presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. In order to keep phosphorous concentrations close to natural background conditions, total nitrogen loading will be the endpoint of this and all Myakka Basin nutrient TMDLs.

6.2.3 Coliform

The coliform listing was based on exceedances of the statewide fecal coliform and total coliform standard. The fecal coliform endpoint is the statewide numeric criteria of a monthly average of ≤200 colonies/100ml, a maximum of 400 colonies/100ml in 10% of the samples, or a maximum of 800 colonies/100ml on any one day. The total coliform endpoint is the statewide numeric criteria of a monthly average of ≤1000 colonies/100ml, a maximum of 1000 colonies/100ml in 20% of samples in one month, or a maximum of 2400 colonies/100ml on any one day. The appropriate target to address coliform impairment for Big Slough and its contributing watersheds is the fecal coliform maximum daily criteria of 800 counts/100 ml for two reasons. Observational data was not, and probably will not be, collected at a frequency necessary to assess maintenance of the monthly average criteria, and the fecal criteria as an indicator is more protective of the designated use than the total coliform indicator.

6.3 Source Assessment

6.3.1 Nutrients

Nitrogen loading to Big Slough and its contributing watersheds can be characterized from the following general sources; surface water, groundwater, and atmospheric deposition. Sources of nitrogen loading to Big Slough are derived based on an examination of land type and use, as calculated from modeling. The modeling tool,WAMView, was run with 1985-2000 rainfall and provides an estimate of total annual average soluble and sediment nitrogen loading from the Big Slough watershed based on landuse and runoff for the period The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the Administrative Record. According to model results, the most significant sources of total nitrogen loading is row crops, representing more than 28 % of the total nitrogen loading to the basin. Other significant sources include freshwater marshes and scrub and brushland. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for about 40 percent of the total nitrogen loading to the Big Slough watershed. The annual average total nitrogen load to Big Slough is estimated as 224,435 kg total nitrogen per year.

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Low Density Residential	1.38	0.68	2,241.3	1,107.8	3349.1	1.5%
Commercial and Services	6.24	9.04	1,466.9	2,124.3	3591.2	1.6%
Rural Land in Transition	1.65	0.10	16,540.2	991.3	17531.5	7.8%
Scrub and Brushland	1.83	0.02	27,437.1	284.6	27721.7	12.4%
Hardwood Conifer Mixed	1.39	0.03	4,390.7	91.8	4482.5	2.0%
Coniferous Plantations	1.38	0.02	101.9	1.7	103.6	0.05%
Open Water	1.63	0.04	568.9	14.1	583.0	0.3%
Bay Swamps	3.80	0.56	132.9	19.5	152.4	0.1%
Mixed Wetland Hardwoods	2.77	0.12	58.1	2.4	60.5	0.03%
Cypress	5.73	0.18	882.0	27.1	909.1	0.4%
Wetland Forested Mixed	4.93	0.11	12,832.9	273.0	13105.9	5.8%
Freshwater Marshes	6.27	0.09	42,254.4	604.8	42859.2	19.1%
Barren Land	6.20	1.73	254.2	71.0	325.2	0.1%
Transportation Corridors	5.60	2.47	1,226.4	540.1	1766.5	0.8%
Medium Density Residential	3.09	2.15	1,108.2	771.9	1880.1	0.8%
High Density Residential	3.86	4.77	1,060.9	1,312.9	2373.8	1.1%
Industrial	11.84	4.47	1,634.0	616.3	2250.3	1.0%
Row Crops	32.34	35.62	30,816.8	33,947.1	64763.9	28.9%
Peach and Pecan Orchards	35.27	0.04	22,289.6	24.9	22314.5	9.9%
Cattle Feeding Operations	329.32	0.44	988.0	1.3	989.3	0.4%
Aquaculture	6.50	0.99	45.5	6.9	52.4	0.02%
Undeveloped Urban Land	1.16	0.34	10,262.7	3,006.3	13269.0	5.9%
Background and Natural	-	-	88659	1319	89978	40.1%
Non-Point Source	-	-	89935	44522	134457	59.9%
Total Load	-	-	178594	45841	224435	100.0%

6.3.2 Coliform

There are no NPDES permitted point sources in the Big Slough basin. Nonpoint sources of fecal coliform may include livestock excrement from barnyards, feedlots, rangelands and uncontrolled manure storage areas. Leaking septic systems, leaking sewage collection systems, and marine discharges may represent another source of coliform bacteria. In addition, because of the very general nature of coliform as an indicator of the presence of pathogens, wildlife such as waterfowl may represent a significant source of coliform bacteria. Another potential nonpoint source of fecal coliform is the resuspension of bacteria indicators and pathogens in sediment (EPA, 2001). Additional monitoring will be required to properly characterize sources of fecal coliform in the Big Slough basin.

6.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

$$TMDL = \Sigma \text{ WLAs} + \Sigma \text{ LAs} + MOS$$

6.4.1 Nutrients

The availability of data influences the types of methods that developers can use. Ideally, extensive monitoring data are available to establish baseline water quality conditions, pollutant source loading, and waterbody system dynamics. However, without long-term monitoring data, the developer will have to use a combination of monitoring, analytical tools (including models), and qualitative assessments to collect information, assess system processes and responses, and make decisions (EPA Nutrient Protocol, 1999). Because the endpoint to address nutrient impairment is to maintain existing nitrogen loads as prescribed in 6.2.2, the source assessment modeling described in 6.3.1 provides the framework for predicting the existing load or average current annual loading conditions.

The TMDL endpoint for nutrient enrichment identified in section 6.2.2 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point source dischargers with allocations for total nitrogen in the Big Slough, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to the listed segment has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. Based on this modeling described in 6.3.1 this load allocation is 224,435 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

where: WLA = zero kg/yr, LA = 224,435 kg/yr, and MOS = -11,222 kg/yr

So the **TMDL = 213,213 kg total nitrogen load/year**

6.4.2 Fecal Coliform

The appropriate fecal coliform criterion used to calculate endpoint for this TMDL, from those criteria identified in 2.2.3, is the maximum daily average standard of 800 counts/100. No mechanistic or empirical modeling tools have been developed for Big Slough to estimate fecal coliform loading. Additional data is needed to evaluate impairment, conduct source assessment, and develop techniques to estimate fecal coliform loading linked to sources. In the meantime, a concentration based approach is used to estimate a fecal coliform loading necessary to meet water quality standards.

The total maximum daily load for fecal coliform loading is being set in order to achieve the load that maintains the water quality standard expressed as a daily maximum concentration of 800 counts fecal coliform per 100 ml sample.

Because there exists very little water quality data in Big Slough, and no obvious methodology to estimate flows in Big Slough, it is not possible to synthesize and quantify coliform loading in this basin. A preliminary concentration-based approach is used to set the allocation for fecal coliform loading in Big Slough. There are no NPDES permitted point sources discharging in Big Slough, and so the wasteload allocation for fecal coliform is zero pounds per day. The agency is targeting the daily maximum criteria of 800 counts/100 ml and also providing an explicit margin of safety of 10% below the criteria. Therefore, the TMDL is as follows:

TMDL = WLA + LA + MOS

where: WLA = zero counts/100ml, LA = 800 counts/ 100 ml, MOS = -80 counts/100ml

TMDL = 0 + 800 counts/100 ml – 80 counts/100ml = 720 counts/100 ml

EPA regulations define the loading capacity as the greatest amount of pollutant (loadings) a waterbody can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. For Big Slough, limited total coliform samples, the lack of instream flow data, and a limited source assessment make it necessary to utilize the State's concentration-based numeric total coliform criterion of 800 colonies/100 mL minus a margin of safety as the loading capacity or "*other appropriate measure*".

6.4.3 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would likely result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

The critical condition for fecal coliform loading to Big Slough is accounted for by the fact that the TMDL is based on concentration applied regardless of flow or loading events in the watershed.

6.4.4 Seasonality

A TMDL must provide consideration for seasonal loading variation to insure that proposed load reductions would result in attainment of water quality standards.

The nutrient TMDL considers data collected under a variety of flow conditions. For this eco-system and climate, the effects of nutrient enrichment may assert themselves during any season.

The seasonality for fecal coliform loading to Big Slough is accounted for by the fact that the TMDL is based on concentration applied regardless of the season.

6.5 Conclusion

TMDLs are proposed to address the Big Slough coliform and nutrient (DO) 303(d) listed impairments. A TMDL for fecal coliform proposes a concentration based allocation. The nutrient TMDL proposes a basin-wide annual allocation for total nitrogen loading equivalent to existing estimated loading with a 5% of the allocation reserved as a margin of safety.

The Florida statewide numeric criterion of 5 mg/l for DO will continue to apply to this watershed until a site specific criterion is developed. If a site specific criterion is not developed to assess dissolved oxygen, the next phase of this TMDL will prescribe load reductions in an attempt to meet the applicable standard. It is our estimation that there is no possible load reductions available to move the measured water parameters above a DO measurement of 5 mg/l because of the natural conditions of the watershed. Therefore, EPA would have to establish a TMDL such that no anthropogenic oxygen demanding material is allowed to enter the waterbody because the TMDL is designed by regulation to reduce any pollutant loading to achieve water quality standards. TMDLs are not proposed to address turbidity or total suspended solids loading. The existing data indicates the basin is attaining standards for turbidity and TSS so no TMDL is needed for these parameters.

Follow-up monitoring, public participation, and implementation for the Big Slough TMDLs are presented in Section 9.

7 Myakka River Estuarine Segment TMDLs

7.1 Introduction

The estuarine segment of Lower Myakka River was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. This waterbody has a Class II use designation meaning the waterbody should support shellfish propagation or harvesting.

7.2 TMDL Endpoint and Water Quality Assessment

The pollutant identified on the 1998 303(d) list was nutrients. The listing of nutrients was based on the fact that the median level of phosphorous exceeded the screening level presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. Data within the estuarine segment indicate that, at times, levels of dissolved oxygen fall below the statewide standard of 5 mg/L.

There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna. The relative ratio of phosphorus to nitrogen throughout the Myakka Basin implies that biological productivity dependent on nutrient enrichment is strongly limited by nitrogen concentrations. Therefore, a TMDL for phosphorus is inappropriate because a water quality result would not be obtained. Furthermore, the phosphorus budget throughout the Myakka Basin is dominated by background sources of phosphorus loading due to naturally phosphorus-enriched soils. Phosphorus would have to be reduced well below background concentrations before the phytoplankton communities could be driven into phosphorus limitation, whereby phosphorus reductions could limit productivity, and subsequently, beneficially impact dissolved oxygen concentrations. In order to keep phosphorous concentrations close to natural background conditions, total nitrogen loading will be the endpoint of this and all Myakka Basin nutrient TMDLs.

7.3 Source Assessment

Nitrogen loading to the Myakka River at its confluence with Big Slough, and its contributing watersheds, can be characterized from the following general sources; surface water, groundwater, and atmospheric deposition. Sources of nitrogen loading to the listed segment are derived based on an examination of land type and use, as calculated from modeling.

The modeling tool, WAMView, was run with 1985-2000 rainfall and provides an estimate of total annual average soluble and sediment nitrogen loading from the segment's contributing watersheds based on landuse and runoff for the period. Model output from a node representing total nitrogen loading to the listed segment just downstream of Myakka River's confluence with Big Slough was used to perform this source characterization. Therefore, loading from all basins in the Myakka watershed including the Big Slough watershed are considered. The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the Administrative Record.

According to model results, the most significant sources of total nitrogen loading is row crops, accounting for approximately 50% of the existing nitrogen loading. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for about 24% percent of the total nitrogen loading to the listed segment's watershed. The annual average total nitrogen load to the Myakka River at the estuarine listed segment is estimated as 1,078,474 kg total nitrogen per year.

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Low Density Residential	1.58	0.61	5,913.3	2,266.4	8179.7	0.8%
Commercial and Services	9.53	5.73	5,938.1	3,567.3	9505.4	0.9%
Rural Land in Transition	1.99	0.14	64,408.2	4,432.9	68841.1	6.4%
Scrub and Brushland	1.65	0.02	74,651.3	800.2	75451.5	7.0%
Hardwood Conifer Mixed	1.22	0.02	8,776.0	169.3	8945.3	0.8%
Coniferous Plantations	1.48	0.03	169.2	3.8	173.0	0.0%
Open Water	1.61	0.05	3,421.7	100.9	3522.6	0.3%
Bay Swamps	4.39	0.56	2,261.3	285.6	2546.9	0.2%
Mixed Wetland Hardwoods	2.72	0.09	100.7	3.5	104.2	0.0%
Cypress	4.99	0.17	2,246.1	78.5	2324.6	0.2%
Wetland Forested Mixed	4.25	0.10	50,065.1	1,150.7	51215.8	4.7%
Freshwater Marshes	5.86	0.08	110,489.4	1,535.3	112024.7	10.4%
Barren Land	7.24	0.88	629.8	76.8	706.6	0.1%
Transportation Corridors	5.48	2.56	2,541.9	1,189.0	3730.9	0.3%
Medium Density Residential	2.99	2.04	1,877.7	1,284.2	3161.9	0.3%
High Density Residential	4.73	4.34	2,799.1	2,566.1	5365.2	0.5%
Industrial	11.81	4.38	4,333.5	1,606.5	5940.0	0.6%
Row Crops	58.93	35.15	341,935.0	203,945.7	545880.7	50.6%
Peach and Pecan Orchards	37.55	0.02	101,570.6	55.5	101626.1	9.4%
Cattle Feeding Operations	320.39	0.13	43,893.2	17.2	43910.4	4.1%
Tree Nurseries	140.96	0.04	7,611.9	2.1	7614.0	0.7%
Dairies	29.80	0.07	2,145.9	4.8	2150.7	0.2%
Aquaculture	3.85	1.35	200.2	70.4	270.6	0.0%
Undeveloped Urban Land	1.17	0.34	10,716.1	3,087.8	13803.9	1.3%
Mining	1.85	0.07	1,427.7	50.2	1477.9	0.1%
Background and Natural	-	-	252181	4128	256309	23.8%
Non-Point Source	-	-	597942	224223	822165	76.2%
Total Load	-	-	850123	228351	1078474	100.0%

7.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

$$\text{TMDL} = \Sigma\ \text{WLAs} + \Sigma\ \text{LAs} + \text{MOS}$$

The availability of data influences the types of methods that developers can use. Ideally, extensive monitoring data are available to establish baseline water quality conditions, pollutant source loading, and waterbody system dynamics. However, without long-term monitoring data, the developer will have to use a combination of monitoring, analytical tools (including models), and qualitative assessments to collect information, assess system processes and responses, and make decisions (EPA Nutrient Protocol, 1999). Because the endpoint to address nutrient impairment is to maintain existing nitrogen loads as prescribed in 7.2, the source assessment modeling described in 7.3 provides the framework for predicting the existing load or average current annual loading conditions.

The TMDL endpoint for nutrient enrichment identified in section 7.2 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point source dischargers with allocations for total nitrogen in the Myakka basin, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to the listed segment has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. Based on this modeling described in 7.3 this load allocation is 1,078,474 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

where: WLA = zero kg/yr, LA = 1,078,474 kg/yr, and MOS = -53,924 kg/yr

TMDL = 1,024,550 kg total nitrogen load/year

7.4.1 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would likely result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

7.4.2 Seasonality

A TMDL must provide consideration for seasonal loading variation to insure that proposed load reductions would result in attainment of water quality standards.

The nutrient TMDL considers data collected under a variety of flow conditions. For this ecosystem and climate, the effects of nutrient enrichment may assert themselves during any season.

7.5 Conclusion

A TMDL is proposed to address nutrient enrichment in the Myakka River estuarine 303(d) listed segment. Follow-up monitoring, public participation, and implementation for the Myakka River estuarine TMDL is presented in Section 9.

8 Warm Mineral Springs Basin TMDLs

8.1 Introduction

Warm Mineral Springs (Figure 8.1) is a Class III estuarine waterbody and also a site of significant historic, archeological, and economic value to the surrounding region. The spring represents the only warm water spring in Florida.

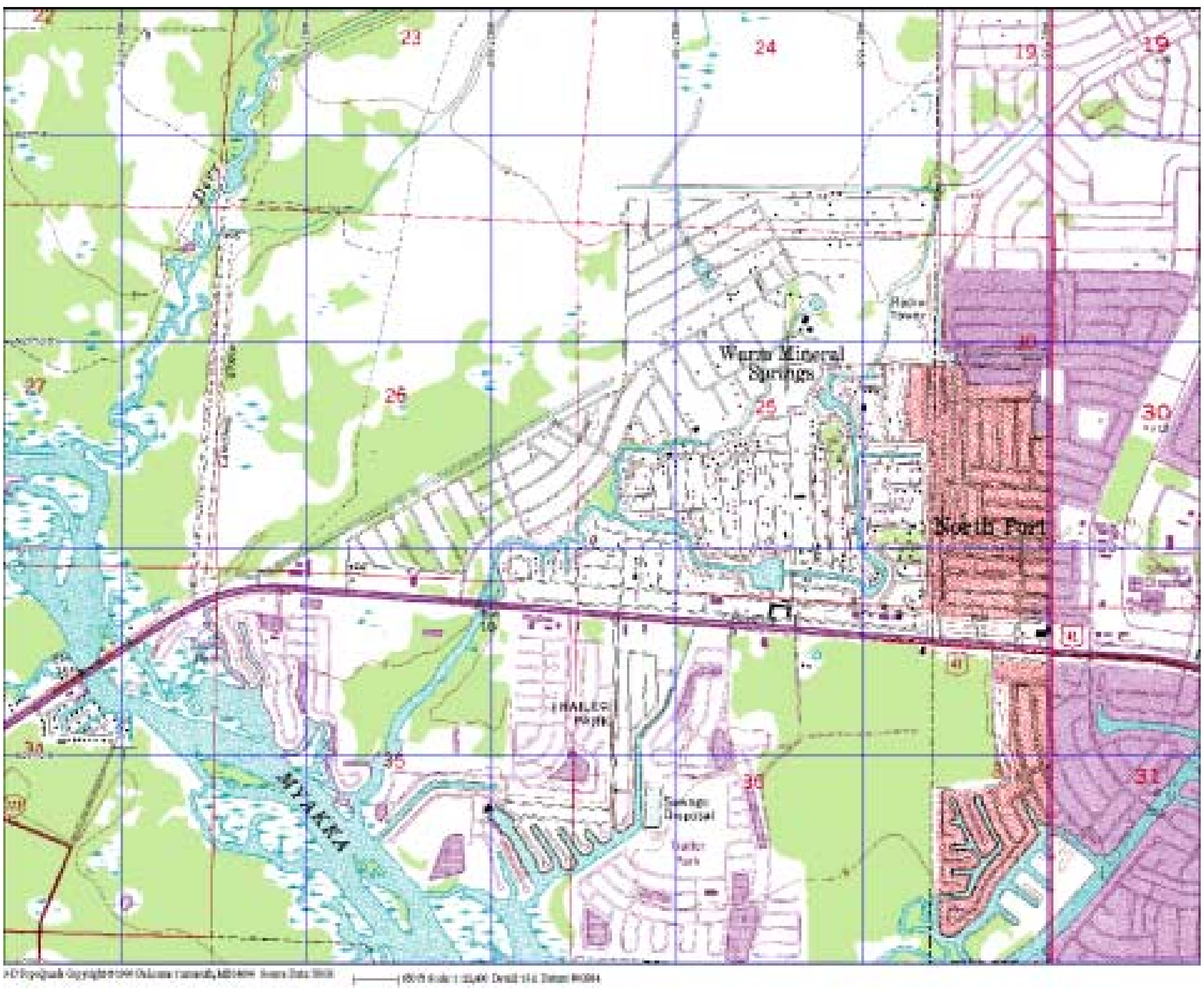

Figure 8.1- Warm Mineral Springs site location map

The area surrounding Warm Mineral Springs is flat and about 10 ft above mean sea level. The soil is sandy and vegetative cover is sparse. Limestone crops out at the edge of the spring pool. Discharge is southwestward through a 20-ft wide run to Salt Creek and about 2 mi more to the Myakka River. The water is salty and has a sulfurous odor and taste. The spring pool has a surface diameter of about 250 feet, and water-surface elevation is about 6 ft above mean sea level. The bottom of the pool slopes gently to a depth of 17 ft, about 40 ft from shore, and then drops off sharply to a debris cone and depths of 124 ft to more than 200 ft below water surface (Florida Geologic Survey, www.flmnh.ufl.edu/springs_of_fl/aaj7320/warm_mineral.html).

Figure 8.2 – Photograph of Warm Mineral Springs at Ortiz Rd. looking upstream

8.2 TMDL Endpoint and Water Quality Assessment

Warm Mineral Springs (listed as unnamed stream) was placed on FDEP=s 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutant was identified as nutrients. The listing of nutrients was based on the fact that the median level of phosphorous and nitrogen exceeded the screening levels presented in the 1996 305(b) report. There are no numeric criteria for nutrients in Florida. The narrative standard for nutrients states that in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance of natural populations of aquatic flora or fauna.

The TMDL endpoint for the parameter of concern is based on adaptive management principles. Phosphorus concentrations in surface freshwater and estuarine waters are naturally enriched throughout the Myakka Basin due to local soil characteristics. Phosphorus concentrations do not appear to impact water quality since the natural flora and fauna of this eco-system are adapted to a nitrogen and light-limiting environment. Additional nitrogen loading above the carrying capacity of this estuarine waterbody could result in water quality problems typical of culturally eutrophying waters. Nitrogen loading should be monitored and controlled in this basin so that no new or additional loads of total nitrogen above current loading enter Warm Mineral Springs.

8.3 Source Assessment

Warm Mineral Springs is a unique groundwater source in the Myakka Basin; it’s a free-flowing deep aquifer spring. Warm Mineral Springs exhibits water quality of a deep spring source- low dissolved oxygen and nitrogen concentrations, thermally elevated water temperature, and significant concentrations of dissolved minerals relevant to ambient surface water. High concentrations of nitrogen in ambient samples of Warm Mineral Spring estuarine surface waters have been observed. This source of nitrogen loading is not believed to exist in the spring water itself, but rather, is introduced as non-point source related to land-use activities or septic tank leacheate in the Warm Mineral Springs estuarine drainage basin including Salt Creek.

The modeling tool, WAMView, was run with 1985-2000 rainfall and provides an estimate of total annual average soluble and sediment nitrogen loading from the segment’s contributing watersheds based on landuse and runoff for the period. The most current landuse data available was used for the modeling, and model details are contained in the model calibration report referenced in the Administrative Record.

According to model results, the most significant sources of total nitrogen loading is freshwater marshes and residential development. Background and natural loading as characterized by land-types that have not been significantly disturbed by anthropogenic activities account for about 39% percent of the total nitrogen loading to the listed segment's watershed. The annual average total nitrogen load to the Warm Mineral Springs estuarine listed segment is estimated as 1,906 kg total nitrogen per year.

Land Use	Attenuated Soluble N (kg/ha/yr)	Attenuated Sediment N (kg/ha/yr)	Attenuated Soluble N (kg/yr)	Attenuated Sediment N (kg/yr)	Average Annual Total N Load (kg/yr)	% of Average Annual Total N Load
Low Density Residential	1.01	0.96	134.6	127.7	262.3	13.8%
Commercial and Services	4.82	10.20	62.6	132.5	195.1	10.2%
Scrub and Brushland	1.46	0.01	200.4	2.0	202.4	10.6%
Hardwood Conifer Mixed	0.82	0.01	10.6	0.2	10.8	0.6%
Open Water	1.33	0.03	26.6	0.6	27.2	1.4%
Bay Swamps	3.53	0.22	7.1	0.4	7.5	0.4%
Wetland Forested Mixed	3.53	0.11	3.5	0.1	3.6	0.2%
Freshwater Marshes	3.86	0.11	470.9	13.3	484.2	25.4%
Transportation Corridors	3.80	4.04	22.8	24.2	47.0	2.5%
Medium Density Residential	2.37	2.24	248.3	235.3	483.6	25.4%
High Density Residential	4.35	4.40	65.3	66.0	131.3	6.9%
Undeveloped Urban Land	0.81	0.57	29.8	21.3	51.1	2.7%
Background and Natural	-	-	719	17	736	38.6%
Non-Point Source	-	-	563	607	1170	61.4%
Total	-	-	1283	624	1906	100.0%

8.4 Total Maximum Daily Load

A TMDL consists of the sum of individual wasteload allocations for point sources (WLAs) and load allocations (LAs) for both nonpoint sources and natural background sources of pollutant for a given waterbody. The TMDL must also consider a margin of safety (MOS) either implicit or explicit, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. The sum of these components must result in the attainment of water quality standards for that waterbody. Thus, the TMDL may be expressed with the following equation:

$$TMDL = \Sigma\ WLAs + \Sigma\ LAs + MOS$$

The TMDL endpoint to address nutrient impairment in Warm Mineral Springs calls for the maintenance of current existing total nitrogen loading with no new or additional sources of nitrogen. Observed data in Warm Mineral Springs estuary is limited. There exist no known NPDES permitted point sources in the Warm Mineral Springs Basin. In addition, the freshwater spring itself, is not considered to be enriched or represent a significant source of nitrogen loading to the estuarine portion of Warm Mineral Springs. Because non-point sources of nitrogen associated with land-use activities in this basin represent the only potential source of nitrogen enrichment above background concentrations, this TMDL will employ a modeling approach that will link land-use activities to nitrogen loading.

The availability of data influences the types of methods that developers can use. Ideally, extensive monitoring data are available to establish baseline water quality conditions, pollutant source loading, and waterbody system dynamics. However, without long-term monitoring data, the developer will have to use a combination of monitoring, analytical tools (including models), and qualitative assessments to collect information, assess system processes and responses, and make decisions (EPA Nutrient Protocol, 1999). Because the endpoint to address nutrient impairment is to maintain existing nitrogen loads as prescribed in 8.2, the source assessment modeling described in 8.3 provides the framework for predicting the existing load or average current annual loading conditions.

The TMDL endpoint for nutrient enrichment identified in section 8.2 supports the maintenance of existing total nitrogen loads based on long-term loading analysis. There are no NPDES permitted point source dischargers with allocations for total nitrogen in the Myakka basin, and so the wasteload allocation for total nitrogen is zero pounds per day. Nonpoint source and background nitrogen loading to the listed segment has been simulated to provide an annual average total nitrogen load based on sixteen years of continuous dynamic modeling. Based on this modeling described in 7.3 this load allocation is 1,906 kg total nitrogen per year. The margin of safety is explicitly expressed as a 5% reserve of the load allocation. Thus, the TMDL can be expressed as:

TMDL = WLA + LA + MOS,

where: WLA = zero kg/yr, LA = 1,906 kg/yr, and MOS = - 95 kg/yr

So the **TMDL = 1,811 kg total nitrogen load/year**

8.4.1 Critical Condition

A TMDL must provide consideration to critical conditions to insure that proposed load reductions would likely result in attainment of water quality standards.

Determining the average annual load based on multiple years of hydrologic conditions insures for the nutrient TMDL that critical loading conditions have been accounted for. Meteorological cycles or events such as El Nino could bias an attempt to estimate average annual load. Consideration of 16 years of nitrogen loading helps to eliminate some of this bias.

8.4.2 Seasonality

A TMDL must provide consideration for seasonal loading variation to insure that proposed load reductions would result in attainment of water quality standards.

The nutrient TMDL considers data collected under a variety of flow conditions. For this eco-system and climate, the effects of nutrient enrichment may assert themselves during any season.

8.5 Conclusion

A TMDL is proposed to address nutrient enrichment in the estuarine 303(d) listed segment: Warm Mineral Springs. Follow-up monitoring, public participation, and implementation for the Warm Mineral Springs TMDL is presented in Section 9.

9 Conclusions

9.1 Implementation

EPA recognizes that implementation of TMDLs is important, since a TMDL improves water quality when the pollutant allocations are implemented, not when a TMDL is established. TMDL implementation – and implementation planning – will be implemented locally with assistance from the State of Florida, through its administration of the National Pollutant Discharge Elimination System (NPDES) point source permit and regulatory or non-regulatory nonpoint source control programs, and local governments through their authorities.

EPA is available to assist the Florida Department of Environmental Protection and the local governments in its implementation of these TMDLs. Stakeholder involvement, including technical advisors and local government officials from the Florida Department of Agriculture, Southwest Water Management District, Charlotte Harbor NEP, and county governments, as well as members of the public, is generally the first step to developing implementation plans and schedules for TMDLs.

9.2 Future Monitoring

9.2.1 Owen Creek

Owen Creek was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants of concern were identified as dissolved oxygen, nutrients, coliforms, total suspended solids (TSS) and turbidity. Data for Owen Creek are sparse and the 303(d) listings for Owen Creek were based on only two to four data points collected in 1993. Since so little data exist for this stream, additional comprehensive monitoring is recommended to verify the accuracy of the 303(d) listing of this waterbody. Parameters that are routinely monitored by FDEP in addition to the 303(d) listed parameters of concern should be monitored in order to fully document the status of the water quality of this stream. The sampling should be conducted in accordance with FDEP guidelines and encompass several monitoring events in each season.

Biological samples were collected and a habitat analysis was conducted near the mouth of the stream in March 1999. The results of the sampling indicated that the macroinvertebrate community was in excellent condition and the habitat was in the suboptimal category. Since this is a 303(d) listed stream, this monitoring should be repeated during the normal basin rotation monitoring activities to track the status of stream health.

Agencies responsible for monitoring activities have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to verify this statement and add to the documentation that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. Bacteria source tracking should be pursued to determine the dominant source of the coliform contamination. This tracking could consist of DNA fingerprinting, biochemical or molecular methods.

9.2.2 Upper Lake Myakka

Upper Lake Myakka was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The listing was based on the fact that the a bioassessment conducted in 1979 - 1980 indicated impairment. No water quality data specific to this waterbody was cited other than the results of the bioassessment. The 1996 305(b) report states that Upper Lake Myakka is eutrophic, with dense mats of hydrilla and water hyacinth and low concentrations of dissolved oxygen. Little water quality data exists for this lake.

No specific parameter of concern has been identified, however low dissolved oxygen may be the most likely issue of concern for the biota. Future comprehensive study is recommended to confirm the current status of the biological community and determine if actual water quality exceedances are present which could adversely affect the biological community of the lake. Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling, using current methods.

9.2.3 Myakka River (Upper segment)

A segment of the Myakka River between Upper Lake Myakka and Lower Lake Myakka was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants of concern were identified as dissolved oxygen, nutrients, coliforms, and total suspended solids. The listing of nutrients was based on the fact that the median level of phosphorous exceeded the screening level presented in the 1996 305(b) report. The coliform listing was based on exceedances of the statewide total coliform standard. The listings for total suspended solids (TSS) was based on based on the fact that the median levels for this parameter exceeded the screening level presented in the 1996 305(b) report.

Monitoring of sites within this portion of the Myakka River has been conducted by several agencies responsible for management activities in the watershed. These agencies include FDEP, Sarasota County, Manatee County, the Southwest Florida Water Management District, USGS and others. The conditions related to the 303(d) list of pollutants of concern have been further documented through these monitoring efforts during the last few years. Periods of low dissolved oxygen persist in this waterbody during certain times of the year and total coliform levels exceed criteria at times. A regular comprehensive monitoring program should be maintained in the watershed so that current conditions, as well as long term trends, can be evaluated.

Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling. Bacteria source tracking should be pursued to determine the dominant source of the coliform contamination. This tracking could consist of DNA fingerprinting, biochemical or molecular methods.

9.2.4 Deer Prairie Slough

Deer Prairie Slough was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants of concern were identified as dissolved oxygen, nutrients, and biochemical oxygen demand (BOD). Monitoring of sites within Deer Prairie Slough has been conducted by several agencies responsible for management activities in the watershed. These agencies include FDEP, Sarasota County, Manatee County, the Southwest Florida Water Management District, USGS and others. The conditions related to the 303(d) list of pollutants of concern as have been further documented through these monitoring efforts during the last few years. Periods of low dissolved oxygen persist in this waterbody during certain times of the year. A regular comprehensive monitoring program should be maintained in the watershed so that current conditions, as well as long term trends, can be evaluated.

Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling.

Follow-up water quality monitoring should be conducted throughout Deer Prairie Slough's watershed to determine if the Deer Prairie Slough Restoration Project (Sarasota County, 2001) provides sufficient remediation to insure that water quality standards are obtained and maintained in this basin.

9.2.5 Mud Lake Slough

Mud Lake Slough was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants of concern were identified as dissolved oxygen, nutrients, coliforms, turbidity and total suspended solids. The listing of nutrients was based on the fact that the median level of phosphorous exceeded the screening level presented in the 1996 305(b) report. The coliform listing was based on exceedances of the statewide fecal coliform criteria. Monitoring of sites within Mud Lake Slough has been conducted by several agencies responsible for management activities in the watershed. These agencies include FDEP, Sarasota County, Manatee County, the Southwest Florida Water Management District, USGS and others. The conditions related to the 303(d) list of pollutants of concern as have been further documented through these monitoring efforts during the last few years. Periods of low dissolved oxygen persist in this waterbody during certain times of the year and fecal coliform levels exceed criteria at times. A regular comprehensive monitoring program should be maintained in the watershed so that current conditions, as well as long term trends, can be evaluated.

Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling. Bacteria source tracking should be pursued to determine the dominant source of the coliform contamination. This tracking could consist of DNA fingerprinting, biochemical or molecular methods.

9.2.6 Big Slough

Big Slough was placed on FDEP's 1998 303(d) list of impaired waters based on their methodology as described in the FDEP 1996 305(b) report. The pollutants of concern were identified as dissolved oxygen, nutrients, and coliforms. The coliform listing was based on exceedances of the statewide fecal coliform and total coliform standard. Monitoring of sites within Big Slough has been conducted by several agencies responsible for management activities in the watershed. These agencies include FDEP, Sarasota County, Manatee County, the Southwest Florida Water Management District, USGS and others. The conditions related to the 303(d) list of pollutants of concern as have been further documented through these monitoring efforts during the last few years. Periods of low dissolved oxygen persist in this waterbody during certain times of the year and coliform levels exceed criteria at times. A regular comprehensive monitoring program should be maintained in the watershed so that current conditions, as well as long term trends, can be evaluated.

Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling. Bacteria source tracking should be pursued to determine the dominant source of the coliform contamination. This tracking could consist of DNA fingerprinting, biochemical or molecular methods.

9.2.7 Myakka River (estuarine segment)

A regular comprehensive monitoring program should be maintained in the watershed so that current conditions, as well as long term trends, can be evaluated.

Agencies responsible for monitoring activities in the watershed have suggested that high nutrient levels and low dissolved oxygen levels are natural to this area and its sluggish blackwater streams. Studies should be conducted to positively determine that these are natural conditions as suspected. The studies and associated monitoring activities should be conducted so that site specific alternative criteria can be developed for the Myakka watershed. This effort should include identification of potential reference areas, sampling of parameters related to the pollutants of concern, and biological sampling. Bacteria source tracking should be pursued to determine the dominant source of the coliform contamination. This tracking could consist of DNA fingerprinting, biochemical or molecular methods.

9.2.8 Warm Mineral Springs

Monitoring must be conducted to determine if anthropogenic sources of nitrogen loading to Warm Mineral Springs are degrading water quality. The assumption that the state-wide nutrient indices that resulted in the Warm Mineral Springs listing indicate water quality problems is insufficient without evidence of such water quality problems. The merit of typical indicators used to detect and quantify the impacts of cultural eutrophication such as phytoplankton productivity, biological diversity, and dissolved oxygen concentrations need to be explored specific to Warm Mineral Springs estuary. The carrying capacity of the spring for nitrogen must be studied and resolved, and site specific water quality criteria should be developed and adopted in Warm Mineral Springs that protect this resource from the effects of cultural eutrophication manifested as excessive nitrogen loading.

9.3 Revisiting this TMDL

EPA will propose and establish this TMDL in accordance with a consent decree deadline, which states that EPA should propose the TMDL by December 31, 2001, and finalize it six months later, unless significant comment is received. However, EPA does plan on revisiting this TMDL in the near future, preferably after the Southwest Florida Water Management District or local organizations develop their estimates of appropriate loading targets to protect water quality in the Myakka watershed. After review of any locally developed loading targets, EPA will adopt those targets as the Agency’s TMDL, if appropriate. EPA prefers load allocations developed by local governments familiar with their watershed. Those allocations are often easier to implement. Also, as described more fully above, EPA understands that much of the area within this watershed probably has DO concentrations, which represent the natural condition. If these lower DO concentrations are the natural condition of the watershed, even an elimination of all anthropomorphic sources of BOD would not result in the waters attaining the statewide DO standard. In fact, attaining that standard could be detrimental to the condition of the watershed. By the time the second phase of this TMDL is implemented, the State will have had a chance to develop more appropriate site specific water quality criteria for dissolved oxygen for the watershed. However, should such site specific criteria not be developed, this TMDL have to establish extreme BOD reductions in an attempt to attain the inappropriate state water quality standard.

9.4 Public Participation

A sixty-day public comment period will be provided for this TMDL document.

Persons wishing to comment on the proposed TMDLs or to offer new data or information regarding the proposed TMDLs are invited to submit the same in writing no later than February 27, 2002, to the U.S. Environmental Protection Agency, Region 4, Water Management Division, 61 Forsyth Street, S.W., Atlanta, Georgia 30303, ATTENTION: Ms. Sibyl Cole, Standards, Monitoring and TMDL Branch. Ms. Cole's telephone number is (404) 562-9437. Ms. Cole may also be contacted via electronic mail at cole.sibyl@epa.gov.

The proposed TMDLs and the supporting documents, including technical information, data, and analyses, may be reviewed at 61 Forsyth Street, S.W., Atlanta, Georgia, between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday. Persons wishing to review this information should contact Ms. Cole to schedule a time for that review. This notice and the proposed TMDLs can also be obtained through the Internet. The URL address for the proposed TMDLs is: http://www.epa.gov/region4/water/tmdl.

The final TMDL Report will include a complete description and summary of the public participation process utilized including a responsiveness summary that documents a summary of comments received with EPA's response and description of applicable changes.

10 References

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